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1997

SOUTH DAKOTA STATE UNIVERSITY

WEST RIVER AG CENTER

CROPS AND SOILS RESEARCH

PLANT SCIENCE PAMPHLET #90

JANUARY 1998

South Dakota State University

SDSU

INTRODUCTION

This is an annual progress report of the West River Crops and Soils Research Projects, South Dakota Agricultural Experiment Station. The equipment storage and processing facilities are located approximately one mile southwest of Box Elder, SD at 21 County Road 212. The office facilities are located at 1905 Plaza Boulevard; Rapid City, SD 57702. Telephone (605)394-2236, e-mail: StymiesC@www.ces.sdstate.edu or jrickert@silver.sdsmt.edu or SwanB@www.ces.sdstate.edu
Internet web page: www.abs.sdstate.edu/wrac/

The Research Projects serve the western part of South Dakota. They are unique in that all experimental plots are cooperatively located with Farmers, Ranchers, or Crop Improvement Associations, through Extension Agents.

The research is conducted on farmers fields under their conditions. The research tests the adaptability of new crops, varieties and farming methods. This report does not include results of work conducted by projects headquartered from the campus at Brookings, South Dakota.

FIELD PLOT COOPERATORS

Name	Address	County
Denny Gearson	Martin 57551	Bennett
Gary Nies	Martin 57551	Bennett
Bill Goeringer	Newell 57760	Butte
William Miller	Oelrichs 57763	Fall River
Roger Rosenow	Ralph 57650	Harding
Tim Komes	Sturgis 57785	Meade
Gregg Krebsbach	New Underwood 57761	Pennington
Jim Madsen	New Underwood 57761	Pennington
Jerry Styles	New Underwood 57761	Pennington
Kathy Clark	Quinn 57775	Pennington
Kent Kjerstad	Quinn 57775	Pennington
David Finneman	Rapid City 57701	Pennington
Don Brown	Scenic 57780	Pennington
Crown Partnership	Wall 57790	Pennington
Rodney Renner	Wall 57790	Pennington
Gary Wunder	Bison 57620	Perkins
Dave Vogel	Hayes 57537	Stanley
Mark Stiegelmeier	Selby 57472	Walworth

This is an annual report, some trials are ongoing and will require additional testing before final conclusions can be made.

250 copies printed at an estimated cost of $2.87 each. January 1998.

South Dakota State University, South Dakota Counties, and U.S. Department of Agriculture Cooperating.

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ACKNOWLEDGMENTS

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The results reported in this pamphlet were funded under Plant Science Projects SD 00956, Research Substation and SD 00320, Conservation Compliance in Western South Dakota. Additional financial support was received from The South Dakota Crop Improvement Association, The South Dakota Wheat Commission, South Dakota Foundation Seed Stocks Division-SDSU, South Dakota Oilseed Council, Monsanto Agricultural Company, Valent Chemical Company, Novartis Crop Protection, Gustafson Corporation, Phosphate & Potash Institute and Warne Chemical Co.

Research was conducted by C.E. Stymiest-Associate Professor, J.R. Rickertsen-Research Associate, B.A. Swan-Senior Ag Research Technician, and in conjunction with F.A. Cholick-Director Ag Experiment Station, D.J. Galenburg-Dept. Head Plant Science, R.G. Hall, R.J. Pollman, J. Ingemansen, S.D. Haley and J.C. Rudd.

A special thank you is extended to Leon Ellis and Tim Hoyt for their help during the summer of 1997.

This publication was written and edited by Clair E. Stymiest, John R. Rickertsen and Bruce A. Swan.

WEATHER SUMMARY

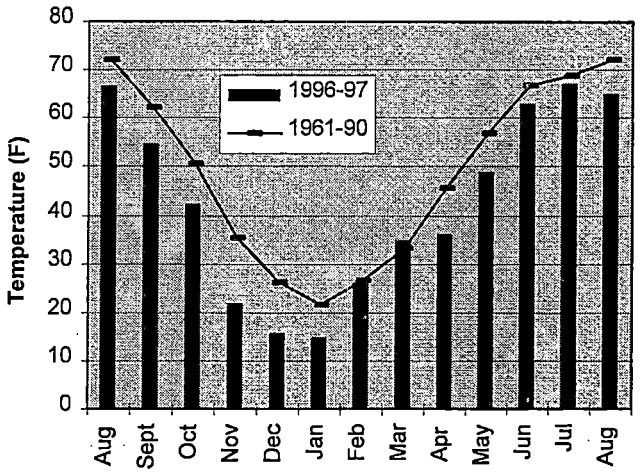
The data in the weather summaries presented in the following charts and Tables 1 and 2 were obtained from the National Oceanic and Atmospheric Administration (NOAA) publication, Climatological Data - South Dakota; from Al Bender, State Climatologist at South Dakota State University; and from the South Dakota Crop-Weather Summary published by the South Dakota Statistical Reporting Service-USDA.

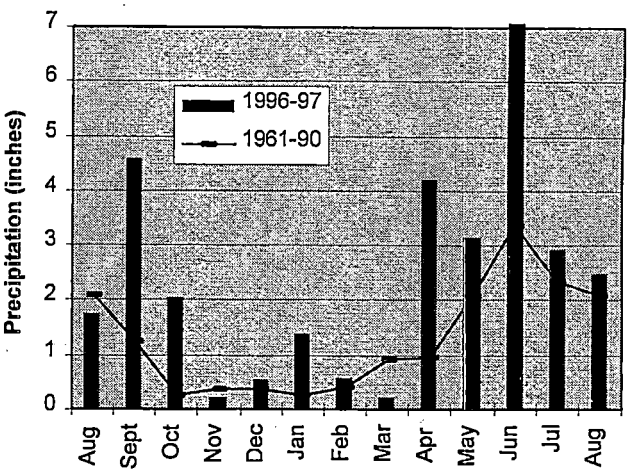
Average air temperatures for August though October were near to slightly below normal for most of western South Dakota except Martin where temperatures were 5 to 8 degrees below normal. November ushered in a very cold period that lasted through January. Readings were 5 to 13 degrees below normal at all locations. Temperatures warmed up in February and March with normal readings. April and May were 2 to 5 degrees cooler than the norm at all locations. June readings were near normal, with the rest of the summer's readings near to slightly below normal.

Precipitation was very plentiful throughout the 1996-97 growing season. September and October rainfall was ½ to 2 inches above normal at most locations. The trend continued during the winter months with above normal precipitation until February, which was near normal. March precipitation was minimal at all locations. The moisture returned in April with most locations receiving ½ to 2 ¾ inches above normal precipitation. May rainfall was ½ to 1 inch below normal in the northwest and ½ to 2 inches above normal elsewhere. June was somewhat below normal in the west central region and wetter at the other locations with Martin receiving 4 inches above normal. July was normal in the northwest and above normal elsewhere. Wasta and Murdo were very wet getting 4 to 6 inches above normal rainfall in July.

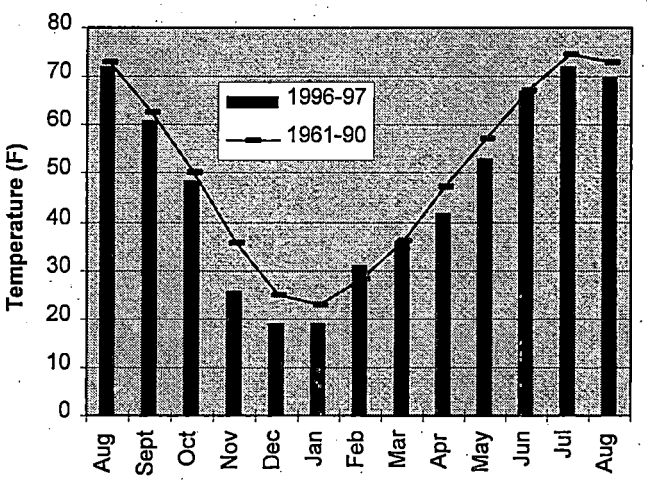
The above normal precipitation and humidity in July and early August caused severe alternaria disease problems for safflower, greatly reducing it's yields. The weather also made it difficult to harvest wheat in a timely manner reducing test weight and quality. Conversely, these conditions were favorable to warm season crops like corn and sunflowers, which had excellent yields in 1997.

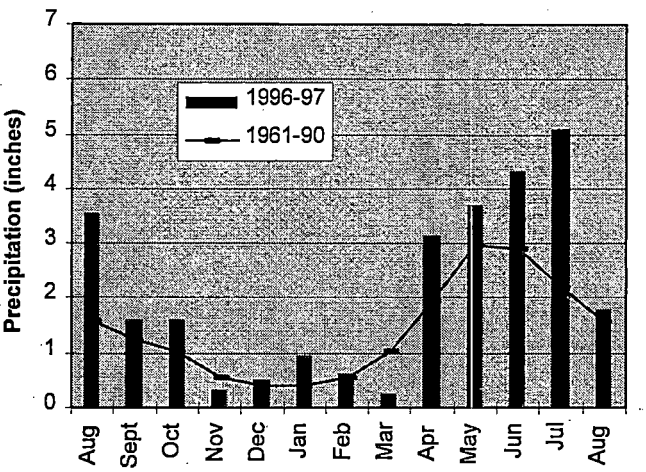
Temperature and Precipitation Charts for Martin (Bennett County Reporting Station).



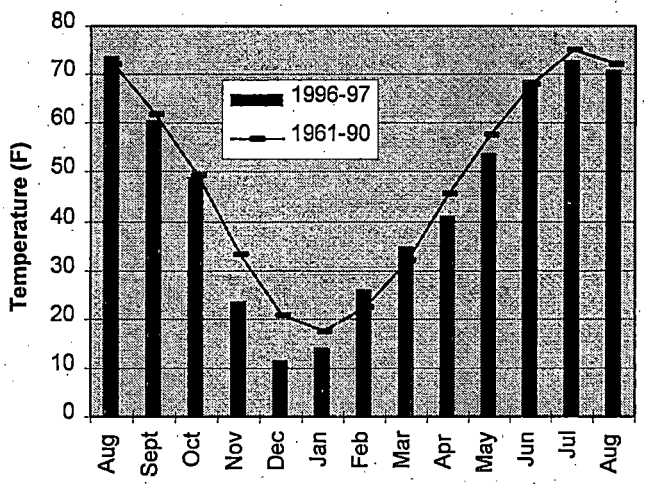


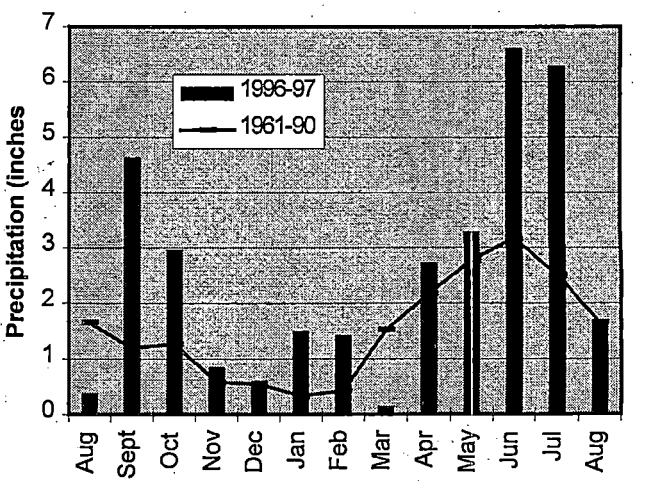
Temperature and Precipitation Charts for Oelrichs (Fall River County Reporting Station).





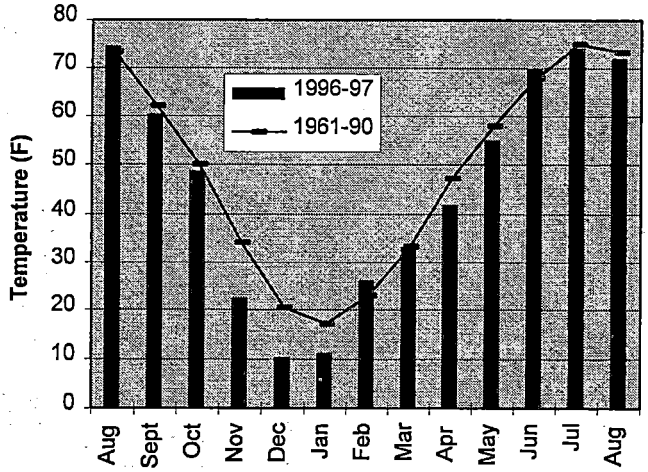
Temperature and Precipitation Charts for Murdo (Jones County Reporting Station).

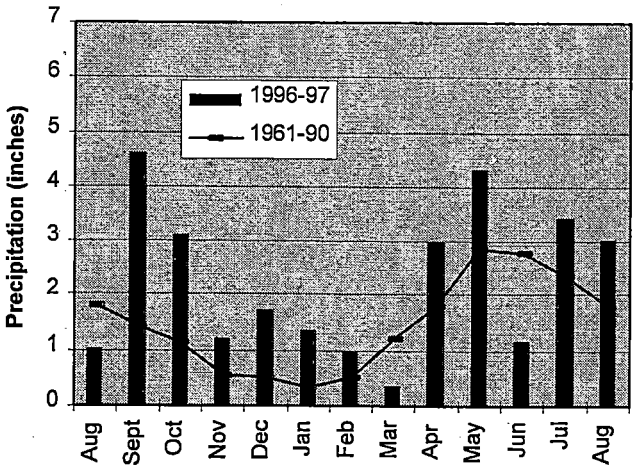




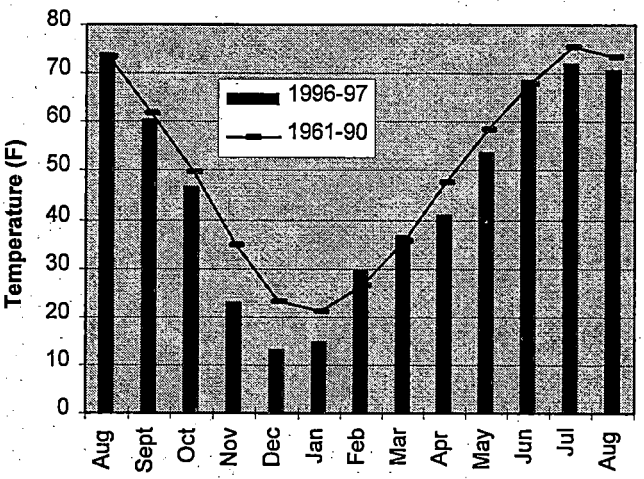
Average temperatures and precipitation obtained from NOAA Climatological Data and from Al Bender, State Climatologist at South Dakota State University. Weather data is collected from the reporting station nearest the experimental sites.

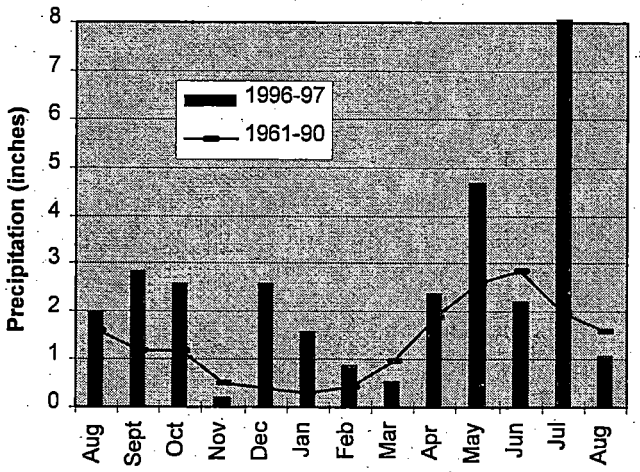
Temperature and Precipitation Charts for Kirley (Haakon County Reporting Station).



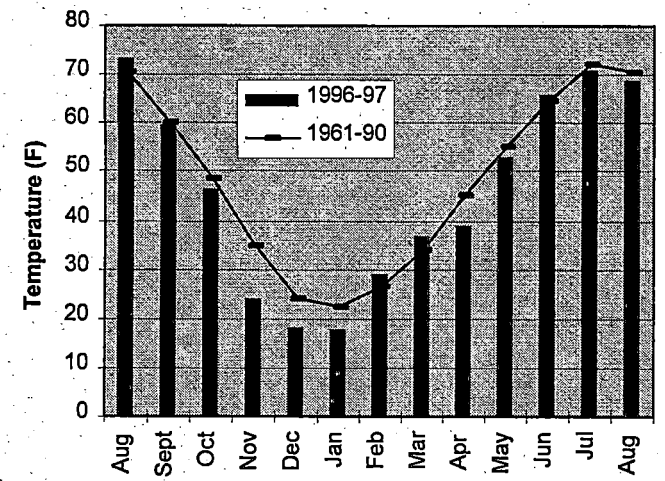


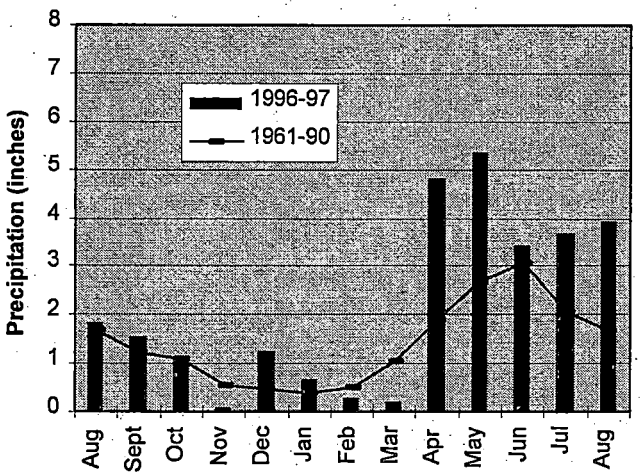
Temperature and Precipitation Charts for Wasta (Pennington County Reporting Station).





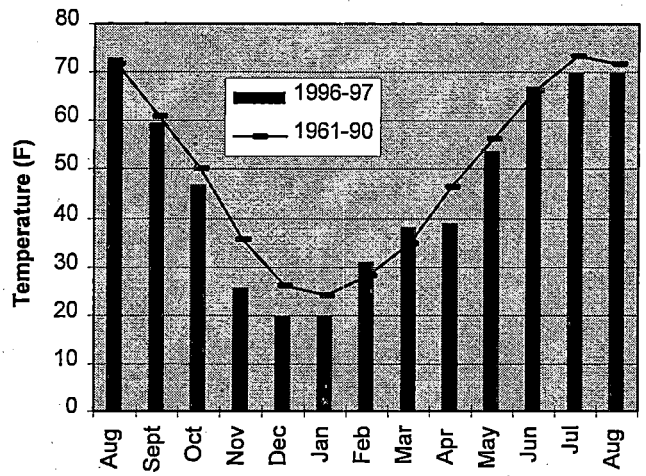
Temperature and Precipitation Charts for Rapid City Airport (Pennington County Reporting Station).

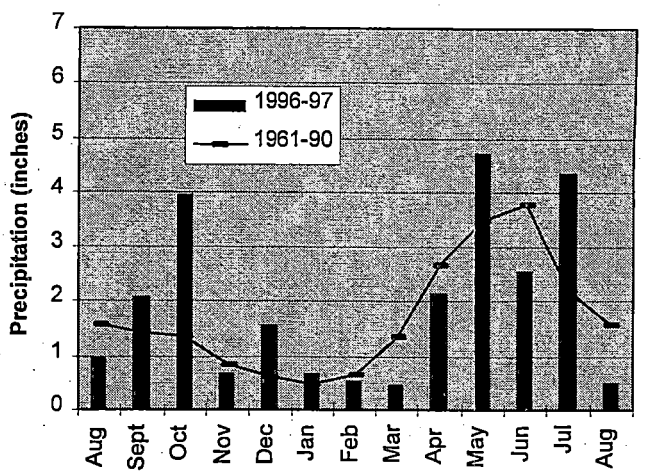




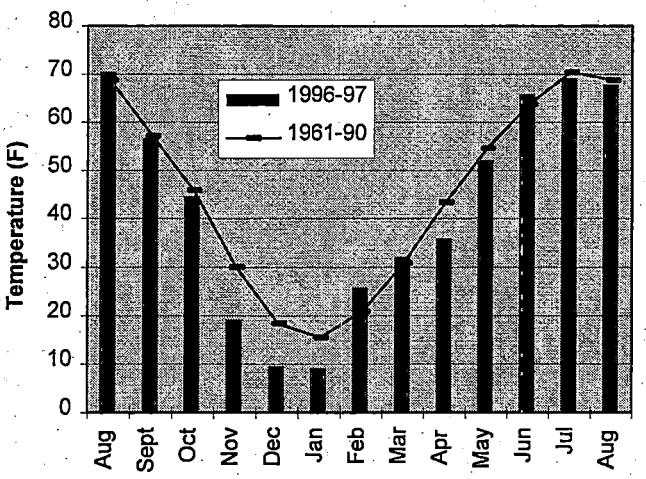
Average temperatures and precipitation obtained from NOAA Climatological Data and from Al Bender, State Climatologist at South Dakota State University. Weather data is collected from the reporting station nearest the experimental sites.

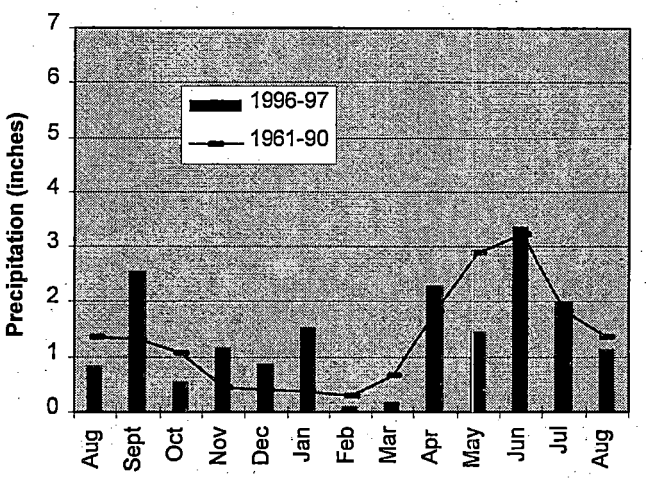
Temperature and Precipitation Charts for Ft. Meade (Meade County Reporting Station).



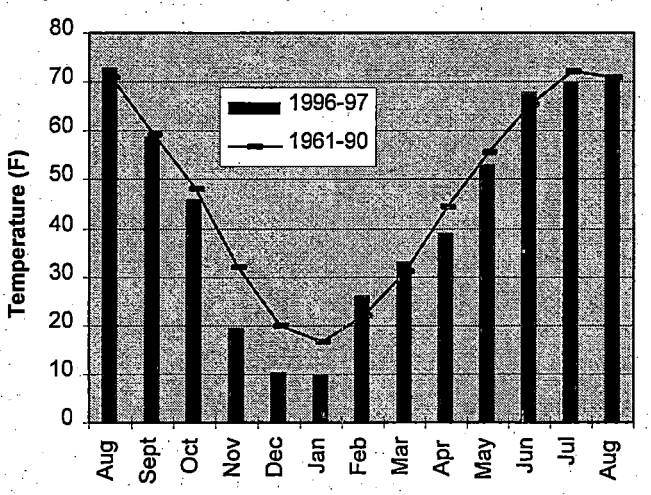


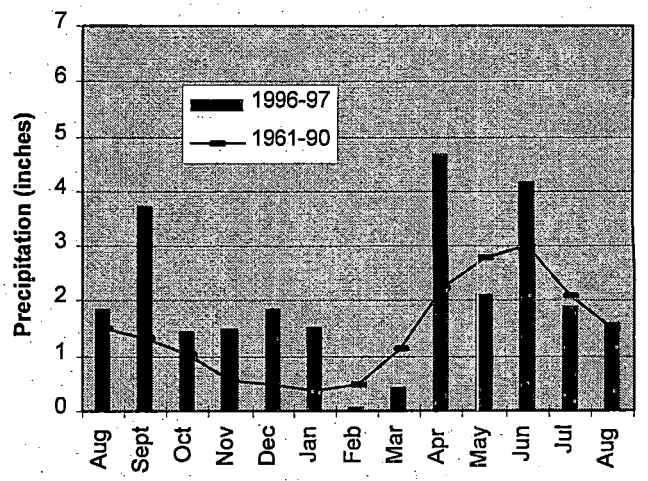
Temperature and Precipitation Charts for Ralph (Harding County Reporting Station).





Temperature and Precipitation Charts for Bison (Perkins County Reporting Station).

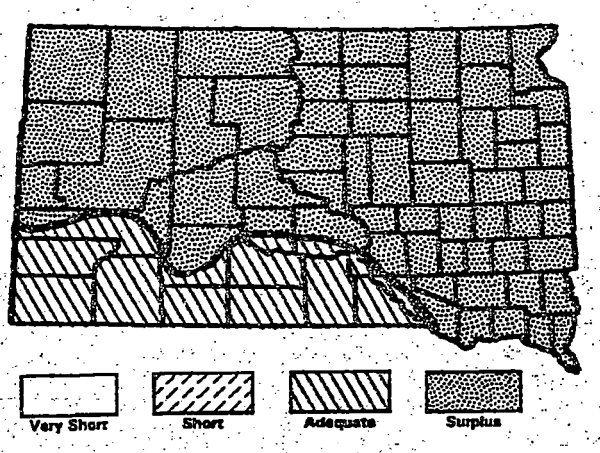




Average temperatures and precipitation obtained from NOAA Climatological Data and from Al Bender, State Climatologist at South Dakota State University. Weather data is collected from the reporting station nearest the experimental sites.

Table 1. Topsoil Moisture Conditions During 1997 Growing Season.
(Crop and Livestock Reporting Service - USDA)

As of Friday, April 11, 1997.



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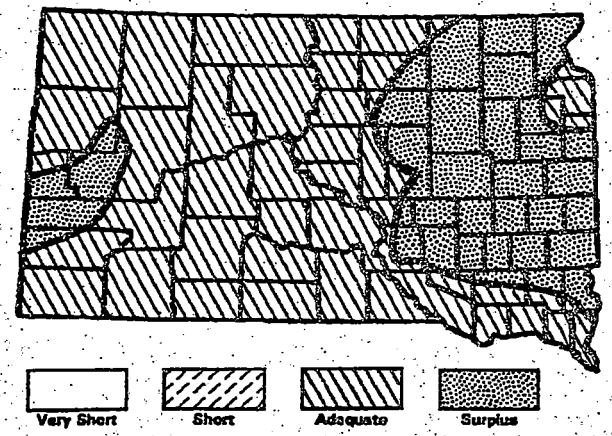

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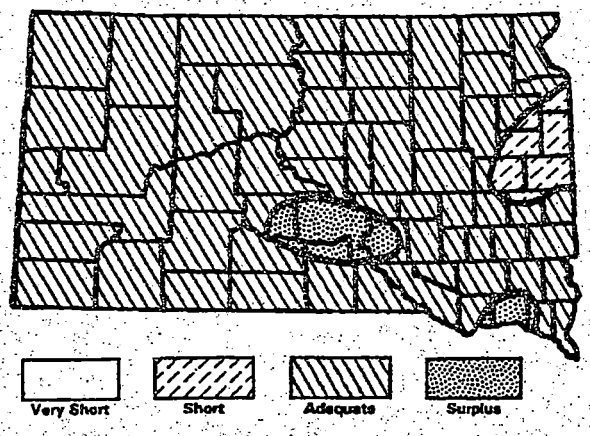
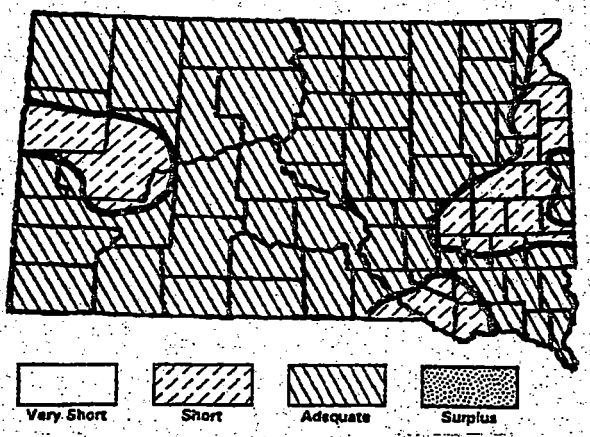
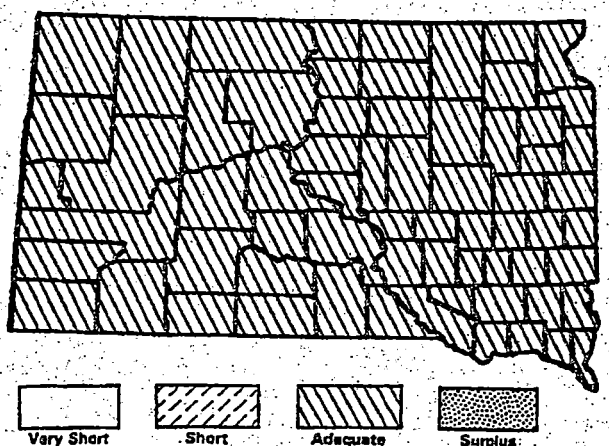


As of Friday, July 18, 1997.



As of Friday, August 15, 1997.



As of Friday, September 19, 1997.

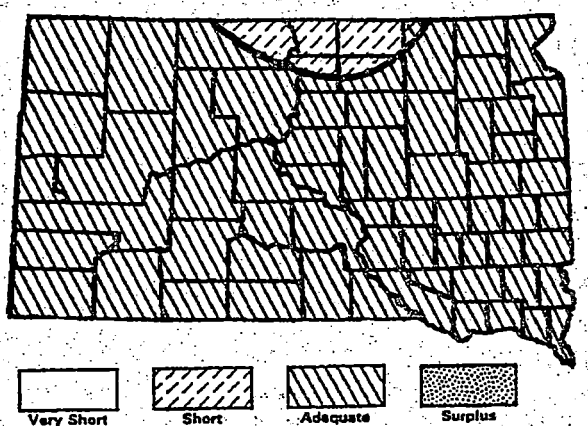


Table 2. Weather Data - Date of Critical Temperatures and Total Useable Precipitation in Counties with Experimental Plots (1996-97).

Location	Date of Temperature*		Total Useable Moisture**	
	Fall-First	Spring-Last	Aug. 96-July 97	April 97-July 97
Bennett County (Martin)	Sept. 24 (27°)	May 19 (28°)	22.17	15.38
Fall River County (Oelrichs)	Oct. 15 (28°)	May 3 (26°)	16.18	11.10
Harding County (Ralph)	Oct. 18 (17°)	May 20 (28°)	10.36	5.58
Jones County (Murdo)	Oct. 18 (25°)	April 16 (28°)	23.29	15.40
Meade County (Ft. Meade)	Oct. 17 (28°)	April 24 (28°)	15.34	9.95
Pennington County (Rapid City AP)	Oct. 17 (24°)	May 3 (28°)	14.94	11.77
Pennington County (Wasta)	Oct. 18 ++	May 3 (28°)	20.48	13.75
Perkins County (Bison)	Oct. 22 (26°)	April 16 (27°)	18.99	9.58
Haakon County (Kirley)	Oct. 18 (27°)	April 14 (21°)	18.06	8.44

* First 28° temperature in Fall or last 28° temperature in Spring, reported in degrees Fahrenheit.

** Sum of all precipitation where amounts were greater than .25 inch or totaled .25 inch in two contiguous days.

++ Temperature recorder was not working at Wasta during the month of October. This is the date of first frost at nearby recording stations.

Studies Abandoned in 1997

Study	Location	Reason Abandoned
Variety Trials		
Winter wheat	Bison, Martin Hayes, Wall	Winterkill
Spring wheat	Bison	Hail
Durum wheat	Bison	Hail
Oats	Bison	Hail
Spring Barley	Bison	Hail
Field Peas	Bison	Hail
Lentils	Wall	Weeds
Chloride by Variety on Winter Wheat	Wall	Winterkill
Chloride rates on Winter Wheat	Wall	Winterkill
Grasshopper Control in Winter Wheat	New Underwood	Overwhelming grasshopper population
Downy Bromegrass control in Winter Wheat with MON37532	New Underwood	Winterkill

WINTER WHEAT VARIETY TRIALS

Objective: To evaluate standard and experimental hard red winter wheat varieties for yield, agronomic characteristics and adaptation to western South Dakota.

Procedure: Plots were seeded at six locations in September 1997 with a John Deere 610 or John Deere 750 plot drills with 10 inch spacing. All locations were fallow the previous year. The experimental design was a randomized complete block with four replications. A seeding rate of 950,000 seeds per acre (60 Lb/A) was used and liquid starter fertilizer (10-34-0 at 6.3 gal/A) applied at 7.4-25-0 pounds per acre. Herbicides were applied in either the fall or spring and varied according to weeds present. Visual stand ratings were taken in October 1996 and April 1997. The plots were trimmed to 5' x 25' after heading. The wheat was harvested in July and August with a small plot combine. Height, shatter, and lodging notes were taken at the time of harvest.

Location Summaries

Plots not harvested

Location	Reason
Bennett County – Martin	Severe winterkill
Stanley County – Hayes	Winterkill
Perkins County – Bison	Winterkill
Pennington County – Wall	Winterkill

Fall River County - Oelrichs

Planted: September 23, 1996 Herbicide: Monsanto MON37500 on October 24, 1996
Harvested: July 23, 1997 Additional Nitrogen: None

Oelrichs had good stands and excellent growing conditions in 1997. Yields averaged an amazing 79 Bu/A with test weights averaging 61 Lb/Bu. Alliance and Quantum 566 were top yielders in 1997. Other varieties that did well were Windstar, Nekota, Arapahoe, 2137, Siouxland and Quantum AP7510. Alliance, Qauntum 566, Qauntum AP7510, Windstar and Arapahoe had the best two-year averages ('96,'97). Results shown in Table 3.

Butte County – Newell

Planted: September 24, 1996 Herbicide:
Harvested: August 5, 1997 Additional Nitrogen: None

Newell had good growing conditions but suffered from poor, uneven stands from the harsh winter. With stands averaging only 56 percent, yields were limited to an average of 26.7 Bu/A. Varieties that did well were Elkhorn, Quantum 566, Nekota, Qauntum AP7510, Arapahoe and Seward. Results are shown in Table 4.

Table 3. Hard Red Winter Wheat Variety Trial - Fall River County (Oelrichs), 1996-97.

Variety	Stand Percent	Height Inches	Lodging 1-5*	Test Wt. Lb/Bu	Yield Bu/A 1997	Yield Bu/A 1996,97
Alliance	90.0	36.5	1.5	60.2	88.6	71.5
Nekota	86.3	34.5	1.3	62.5	87.1	67.9
Arapahoe	90.0	38.5	1.3	60.6	86.4	72.1
Tandem	90.0	41.0	2.5	63.0	77.6	65.6
Quantum 566	90.0	38.5	1.3	62.3	96.3	76.0
Quantum AP7510	90.0	30.8	1.0	61.5	85.6	71.9
Dawn	90.0	35.8	2.0	61.0	73.9	60.1
2137	90.0	35.3	1.0	61.4	86.2	66.5
Jagger	85.0	32.8	1.0	60.9	77.6	62.2
2174	90.0	33.5	1.0	60.6	73.6	--
Ogallala	88.8	30.0	1.0	62.2	74.1	--
Crimson	90.0	42.5	1.0	62.4	76.0	64.6
Rose	90.0	41.8	1.0	62.6	75.1	62.5
Seward	87.5	46.5	1.8	59.9	70.2	56.5
Roughrider	90.0	47.5	2.5	62.5	70.7	58.3
Elkhorn	90.0	49.8	2.0	59.5	71.5	59.5
Nuwest	90.0	41.3	1.0	59.6	71.6	59.3
McGuire	87.5	40.0	1.0	61.4	71.8	--
Windstar	90.0	38.0	1.3	59.7	87.3	73.7
Niobrara	81.3	37.5	1.3	59.9	74.8	65.0
Pronghorn	90.0	44.5	3.5	62.0	83.6	69.1
Siouxland	90.0	45.0	1.3	60.4	85.6	70.6
Scout 66	90.0	46.8	4.8	60.8	67.1	58.0
TAM 107	90.0	33.3	1.3	60.8	78.5	62.6
TAM 110	81.3	34.0	1.0	60.7	77.9	--
Vista	82.5	34.5	1.3	60.7	81.6	67.0
Halt	90.0	33.3	1.0	58.5	76.1	65.2
SD 92107 [EXP]	90.0	43.3	1.3	60.5	82.3	70.0
SD 92191 [EXP]	90.0	45.0	1.0	61.4	82.2	67.5
SD 92227 [EXP]	90.0	43.8	1.0	62.6	81.4	69.8
SD 93267 [EXP]	90.0	47.3	1.5	62.8	80.5	--
SD 93336 [EXP]	90.0	42.8	1.0	62.0	79.1	--
SD 93364 [EXP]	90.0	40.3	1.0	61.4	81.1	--
SD 93380 [EXP]	90.0	38.5	1.0	58.9	84.8	--
SD 93500 [EXP]	90.0	41.8	1.3	58.1	73.7	--
NE 93554 [EXP]	90.0	36.3	1.0	61.1	83.4	--
NE 92662 [EXP]	88.8	38.0	1.0	59.2	81.9	--
Average	88.8	39.4	1.4	60.9	79.3	65.8
LSD (.05)	3.19	2.58	0.68	1.35	7.8	NA
CV	2.56	4.68	34.24	1.58	7.02	NA

* 1=No lodging, 5 = >80% lodged.

[EXP] Experimental varieties.

Table 4. Hard Red Winter Wheat Variety Trial - Butte County (Newell), 1997.

Variety	Stand Percent	Height Inches	Test Wt. Lb/Bu	Yield Bu/A
Alliance	55.0	26.5	53.1	25.6
Nekota	57.5	25.8	54.5	29.8
Arapahoe	50.0	28.5	53.9	28.9
SD 89119	57.5	30.3	54.7	26.4
Quantum 566	50.0	31.0	54.4	30.2
Agripro AP7510	52.5	23.3	55.4	29.3
Dawn	40.0	27.5	54.6	24.5
2137	55.0	23.8	54.8	27.5
Jagger	62.5	24.0	54.9	23.8
Ogallala	57.5	22.5	54.8	23.1
SD 89153	58.8	30.0	55.2	27.6
Rose	45.0	29.0	54.8	28.5
Seward	55.0	34.5	53.0	28.0
Roughrider	73.8	34.5	54.7	25.5
Elkhorn	63.8	35.8	53.8	32.3
Windstar	57.5	27.0	53.1	23.5
Pronghorn	63.8	28.3	54.8	26.9
Siouxland	62.5	30.3	54.3	23.0
Scout 66	57.5	31.8	53.4	21.3
TAM 107	52.5	23.3	51.6	20.1
Vista	55.0	21.8	53.4	27.7
Average	56.3	28.0	54.8	26.6
LSD (.05)	19.03	2.56	1.39	5.21
CV	23.9	6.45	1.82	13.98

Lyman County – Kennebec

The winter wheat variety strips near Kennebec were planted in September 1996 with a farm sized deep furrow drill. The varieties were seeded in five-foot strips 400 feet long, with a check strip of the variety Nekota after every fourth entry. The wet growing conditions and variable stands favored the later maturing varieties, which is not normal for this region of the state. The weather An 80 foot strip was harvested on July 22 with a small plot combine and the information is given in Table 10. This was a single rep trial so the information is not statistically analyzed. The yields from the Nekota check strips were somewhat variable. Therefore variety comparisons should be made carefully.

Table 5. Hard Red Winter Wheat Variety Strip – Lyman County (Kennebec), 1997.

Variety	Height Inches	Lodging 1-5*	Protein Percent	Test Wt Lb/Bu	Yield(13%) Bu/A
Scout 66	37	2	12.9	60.4	44.1
Rose	34	1	11.7	62.1	50.6
Nekota check	31	1		59.5	45.3
Ogallala	25	1	13.3	61.1	44.4
Elkhorn	40	1	11.8	58.6	45.5
Roughrider	38	1	12.2	60.0	40.6
Pronghorn	34	1	11.8	61.1	44.7
Nekota check	26	1		60.0	40.1
Agate	32	1	12.4	60.2	47.4
Quantum 549	34	1	12.7	61.0	47.3
Quantum AP 7510	27	1	12.8	60.5	46.6
Dawn	27	1	12.2	61.2	41.6
Nekota check	26	1		59.7	41.0
Siouxland	32	1	12.8	60.1	41.7
Seward	37	1	11.2	60.2	49.2
SD 92191	38	1	11.2	62.9	46.8
Windstar	31	1	12.3	58.3	45.4
Nekota check	24	1		59.5	37.4
Nekota	28	1	12.6	60.2	43.3
Arapahoe	30	1	12.8	59.4	42.8
Tandem	32	1	11.8	61.1	47.8
2137	28	1	12.5	60.7	40.5
Nekota check	27	1		60.7	38.1
SD 92107	32	1	11.5	61.0	50.1
Quantum 566	31	1	10.7	60.7	42.7
SD 92227	34	1	11.3	62.5	50.0
Alliance	29	1	12.7	59.3	47.5
Nekota check	28	1		60.8	41.3
Jagger	28	1	12.7	59.4	40.9
Crimson	36	1	10.7	63.2	50.5
Weathermaster	28	1	11.9	60.1	35.4
Lancer	35	1	11.9	59.1	35.1
Nekota check	26	1		58.7	35.9
Check Average	26.9	1.0	NA	59.8	39.9
Plot Average	32.0	1.0	12.1	60.6	44.7

* 1=No lodging, 5 = >80% lodged.

Meade County – Bear Butte Valley

The winter wheat variety strips near Bear Butte were planted on September 24, 1996 with a John Deere 610 plot drill. The varieties were seeded in ten foot strips 100 feet long, with a check strip of the variety Arapahoe after every fourth entry. The ground was no-till fallow cornstalks prior to planting and received good snowcover so survival was excellent. Good growing conditions and plentiful rainfall contributed to excellent yields. An 80 foot strip was harvested on August 2, 1997 with a small plot combine and the information is given in Table 5. This was a single rep trial so the information is not statistically analyzed. The yields from the Nekota check strips were fairly consistent, indicating a uniform field. Therefore careful variety comparisons can be made.

Table 6. Hard Red Winter Wheat Variety Strip – Meade County (Sturgis), 1997.

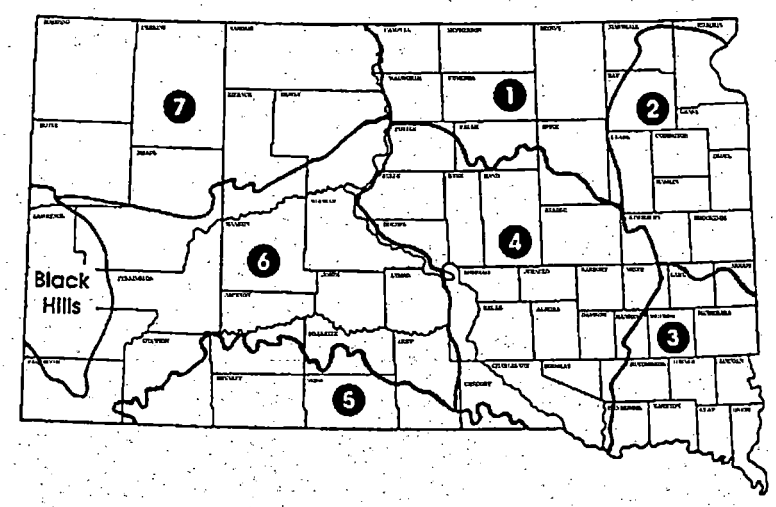
Variety	Height Inches	Stand Percent	Lodging 1-5*	Test Wt Lb/Bu	Yield Bu/A
Arapahoe check	35	90	1	58.8	67.7
Alliance	33	90	1	58.3	71.3
Nekota	35	90	1	59.7	70.0
Arapahoe	36	90	1	57.8	71.8
Tandem	38	90	1	58.7	69.9
Arapahoe check	35	90	1	58.3	70.6
Quantum 566	36	90	1	60.0	77.9
Agripro AP7510	30	90	1	60.4	75.3
Dawn	38	90	1	56.3	68.7
2137	32	90	1	57.3	78.8
Arapahoe check	37	90	1	57.7	72.3
Jagger	33	90	1	60.0	75.1
Ogallala	29	90	1	60.0	69.4
Crimson	39	90	1	61.0	70.0
Rose	39	90	1	59.8	67.9
Arapahoe check	36	90	1	56.2	74.2
Seward	40	90	2	57.7	59.8
Roughrider	40	90	1	61.1	59.0
Elkhorn	44	90	2	58.4	59.2
Windstar	35	90	1	57.8	75.0
Arapahoe check	35	90	1	58.4	70.3
Pronghorn	40	90	1	58.6	70.8
Siouxland	44	90	1	58.6	69.1
Scout 66	43	90	2.5	59.3	67.1
TAM 107	29	90	1	55.6	69.3
Arapahoe check	36	90	1	57.8	76.2
Vista	30	90	1	58.4	74.2
Arapahoe check	36	90	1	58.7	77.9
Check Average	35.7	90.0	1.0	58.0	72.7
Plot Average	36.3	90.0	1.2	58.8	70.0

* 1=No lodging, 5 = >80% lodged.

WHEAT VARIETY RECOMMENDATIONS FOR 1998

Crop Adaptation Areas for South Dakota

(Revised 1992)



WINTER WHEAT

Recommended:

Variety	*Crop Adaptation Area*
Alliance [PVP]	3,4[pc],5,6
Arapahoe [PVP]	1,3,4[pc],5,6,7
Nekota	1[pc],3,4[pc],5,6,7[pc]
Quantum 566 (hybrid)	1[pc],3,4[pc],5,6,7[pc]
Rose	1[pc],2[pc],3[N],4[pc],6,7
Seward	1[pc],2[pc],4[pc],6,7
Windstar [PVP]	1[pc],3,4[pc],5,6,7[pc]

Acceptable/Promising:

Variety	*Crop Adaptation Area*
Dawn	4[pc],5,6
Pronghorn	4[pc],5,6,
Elkhorn	1[pc],2[pc],4[pc],6,7
Roughrider	1[pc],2[pc],4,7
Siouxland [PVP]	3,4[pc],5,6
TAM 107 [PVP]	4[pc],5,6
2137 [PVP]	1[pc],3,4[pc],5,6,7[pc]

SPRING WHEAT

Recommended:

Variety	*Crop Adaptation Area*
Butte 86	Statewide
Sharp	Statewide
2375 [PVP #]	Statewide
Russ [PVP]	Statewide
Oxen [PVP]	Statewide
Forge [PVP]	Statewide

Acceptable/Promising:

Variety	*Crop Adaptation Area*
Kulm [PVP]	Statewide
Prospect	1[W],4[W],6,7
Verde [PVP]	Statewide
Keene [PVP]	1[W],4[W],6,7

DURUM WHEAT

Recommended:

Variety	*Crop Adaptation Area*
Munich [PVP]	All durum areas
Monroe	All durum areas
Renville	All durum areas
Vic	All durum areas
Ben [PVP]	All durum areas

[PVP] U.S. Plant Variety Protection applied for and/or issued; seed sales of these varieties are restricted to classes of certified seed.

[pc] Plant into protective cover.

2375 is owned by the North Dakota State University Research Foundation (NDSURF). Seed is available for increase and sale as a class of certified seed through an agreement between NDSURF and South Dakota Foundation Seed Stocks Division of SDSU.

[N] Northern half of crop adaptation area.

[W] Western half of crop adaptation area.

Source - Small Grains 1998 Variety Recommendations, EC744

SPRING WHEAT VARIETY TRIALS

Objective: To evaluate standard and experimental hard red spring wheat varieties for yield, agronomic characteristics and adaptation to western South Dakota.

Procedure: Plots were seeded at three locations in April 1997 with a John Deere 610 plot drill with 10 inch spacing. All locations were fallow the previous year. The experimental design was a randomized complete block with four replications. A seeding rate of 1,390,000 seeds per acre (90 Lb/A) was used and liquid starter fertilizer (10-34-0 at 6.3 gal/A) applied at 7.4-25-0 pounds per acre. Herbicides were applied in early June and varied according to weeds present. Plots were trimmed to 5' x 25' after heading. The wheat was harvested in July and August with a small plot combine. Height, shatter, and lodging notes were taken at the time of harvest.

Location Summaries

Plots not Harvested

Location	Reason
Perkins County - Bison	Hail

Pennington County – Wall

Planted: April 1, 1997
Harvested: July 28, 1997
Herbicide: Ally ($^{1}/_{10}$ oz/A) + 2,4-D (8 oz/A LV-4), June 6.
Additional Nitrogen: None

Wall had fair stands and cool, wet growing conditions in 1997. The plot averaged 39.0 Bu/A and test weights averaged 60.3 Lb/Bu. The best yielders in 1997 were Lars, Oxen, Prospect, Forge and Russ. Varieties with good two year averages were Lars, Oxen, Forge and Prospect. Results are shown in Table 7.

Harding County - Ralph

Planted: April 29, 1997
Harvested: August 19, 1997
Herbicide: Ally ($^{1}/_{10}$ oz/A) + 2,4-D (8 oz/A LV-4) + Assert (1 pint/A), June 18.
Additional Nitrogen: None

Growing conditions for spring grains were fair at Ralph in 1997. The average yield was 29.2 Bu/A with test weights averaging 59.9 Bu/A.. 1997 top yielders were 2398, Norlander, Forge, Verde, Russ and 2375. Over the past three years Forge, Oxen, Russ and Norlander have looked the best. Results are presented in Table 8.

Table 7. Hard Red Spring Wheat Variety Trial – Pennington county (Wall), 1995, 97.

Variety	Height Inches	Test Wt. Lb/Bu	Yield 1997	Bu/A 1995,97*
Butte 86	32.5	60.6	37.5	37.7
Chris	33.3	59.7	28.6	27.7
Forge	31.5	62.6	41.6	39.4
Hamer	26.8	60.7	35.4	32.2
Keene	34.5	59.3	37.0	34.9
Kulm	33.3	62.0	36.6	34.4
Lars	24.5	59.8	45.0	41.3
Nora	24.5	60.4	36.9	--
Norlander	26.3	59.7	38.8	35.8
Prospect	29.0	60.6	42.2	38.9
Russ	31.0	58.8	40.5	35.8
Sharp	31.3	60.8	34.5	33.6
Sharpshooter	31.8	59.8	40.2	--
Trenton	35.0	60.6	36.9	35.9
Verde	28.8	60.3	39.6	38.3
2375	27.5	61.4	39.4	38.2
2398	28.5	59.7	39.1	--
Oxen	30.0	59.8	44.6	40.7
Vanna	27.5	57.4	42.8	--
SBE 0050 EXP	28.8	61.0	44.3	--
SBF 0402 EXP	28.5	61.6	37.7	--
SD 8108 EXP	32.3	59.5	41.6	--
SD 3219 EXP	30.3	61.2	36.5	--
SD 3249 EXP	31.3	62.0	33.2	--
SD 8119 EXP	31.5	59.2	39.2	--
SD 3310 EXP	31.3	61.2	41.3	--
AVERAGE	30.1	60.3	39.0	36.3
LSD (.05)	2.23	1.68	5.78	--
CV	5.23	1.97	10.48	--

* Two year average of 1995 & '97.
EXP Experimental varieties.

Table 8. Hard Red Spring Wheat Variety Trial - Harding County (Ralph), 1995-97.

Variety	Height Inches	Test Wt. Lb/Bu	Yield 1997	Bu/A 1995-97
Butte 86	24.0	60.6	26.5	33
Chris	28.0	59.8	28.1	28
Forge	23.5	61.4	30.9	39
Hamer	22.0	58.8	27.7	32
Keeme	27.3	61.5	27.0	35
Kulm	24.8	60.9	29.1	31
Lars	19.5	58.3	28.7	35
Nora	19.3	57.0	25.5	--
Norlander	23.0	60.1	31.1	37
Prospect	23.0	60.2	30.1	34
Russ	26.0	59.0	30.6	37
Sharp	26.0	61.6	25.9	33
Sharpshooter	24.0	61.5	26.6	--
Trenton	26.8	60.7	26.7	35
Verde	23.8	60.3	30.7	36
2375	22.5	59.3	30.4	34
2398	23.3	60.2	32.0	--
Oxen	22.0	58.7	28.7	38
Vanna	22.3	53.9	24.0	--
SBE 0050 [EXP]	21.8	58.4	31.0	--
SBF 0402 [EXP]	22.0	60.2	31.0	--
SD 8108 [EXP]	24.8	60.7	29.2	--
SD 3219 [EXP]	24.0	61.5	33.5	--
SD 3249 [EXP]	24.5	62.7	30.9	--
SD 8119 [EXP]	24.8	59.3	29.5	--
SD 3310 [EXP]	25.0	61.0	30.5	--
AVERAGE	23.8	59.8	29.1	34
LSD (.05)	1.73	1.03	4.21	NS
CV	5.12	1.22	10.22	11

[EXP] Experimental varieties.

DURUM WHEAT VARIETY TRIALS

Objective: To evaluate standard and experimental durum wheat varieties for yield, agronomic characteristics and adaptation to western South Dakota.

Procedure: Plots were seeded at three locations in April 1997 with a John Deere 610 plot drill with 10 inch spacing. All locations were fallow the previous year. The experimental design was a randomized complete block with four replications. A seeding rate of 1,390,000 seeds per acre (90 Lb/A) was used and liquid starter fertilizer (10-34-0 at 6.3 gal/A) applied at 7.4-25-0 pounds per acre. Herbicides were applied in early June and varied according to weeds present. Plots were trimmed to 5' x 25' after heading. The wheat was harvested in July and August with a small plot combine. Height, shatter, and lodging notes were taken at the time of harvest.

Location Summaries

Plots not Harvested

Location	Reason
Perkins County – Bison	Hail

Pennington County – Wall

Planted: April 1, 1997
Harvested: August 4, 1997

Herbicide: Ally ($^{1}/_{10}$ oz/A) + 2,4-D (8 oz/A LV-4), June 6.
Additional Nitrogen: None

Wall had cool and very wet conditions for 1997. This lead to yields averaging 31.6 Bu/A and very poor test weights averaging only 54.5 Lb/Bu. The stands were variable which combined with the poor growing conditions gave very high Coefficient of Variation (CV). Because of this variety comparisons should not be made at this location. Results are shown in Table 9.

Harding County - Ralph

Planted: April 29, 1997
Harvested: August 19, 1997

Herbicide: Ally ($^{1}/_{10}$ oz/A) + 2,4-D (8 oz/A LV-4) + Assert (1 pint/A), June 18.
Additional Nitrogen: None

Ralph had fair conditions for durum wheat in 1997 with the average yield of 28.8 Bu/A being below normal for Ralph. Test weights were average at 60.6 Lb/Bu. Renville, Ben, Vic and Munich were the top varieties in 1997 and the three year averages showed the varieties Renville, Munich and Ben with the best yields. Results are shown in Table 10.

Table 9. Durum Wheat Variety Trial - Pennington County (Wall), 1995-97.

Variety	Height Inches	Test Wt. Lb/Bu	Yield Bu/A 1997	Yield Bu/A 1995, 97*
Ben	33.3	55.3	35.5	33.3
Monroe	31.3	54.5	28.0	29.9
Munich	27.8	54.4	31.0	29.7
Renville	31.8	54.7	33.5	33.6
Vic	31.3	54.6	27.9	27.7
ND D87240	31.0	53.8	33.8	--
AVERAGE	31.0	54.5	31.6	30.8
LSD (.05)	3.43	1.97	11.72	--
CV	7.33	2.4	24.59	--

* Two year average of 1995 & '97.

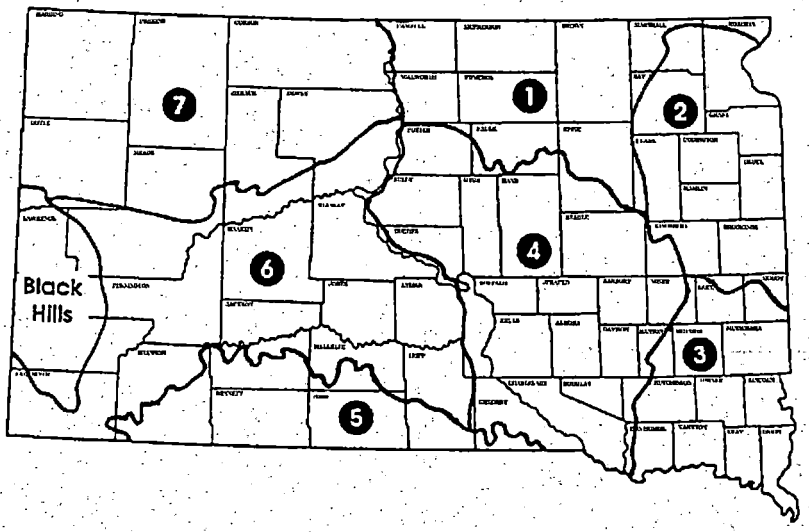
Table 10. Durum Wheat Variety Trial - Harding County (Ralph), 1995-97.

Variety	Height Inches	Test Wt. Lb/Bu	Yield Bu/A 1997	Yield Bu/A 1995-97
Ben	24.0	61.3	26.9	35
Monroe	24.8	59.5	22.7	33
Munich	23.0	59.6	26.0	36
Renville	25.8	60.8	26.9	37
Vic	26.8	61.9	26.6	34
ND D87240	24.8	60.5	25.8	--
AVERAGE	24.8	60.6	25.8	35
LSD (.05)	2.38	0.68	2.98	3
CV	6.35	0.74	7.68	7

OAT AND BARLEY VARIETY RECOMMENDATIONS FOR 1997

Crop Adaptation Areas for South Dakota

(Revised 1992)



OATS

Recommended:

Variety	*Crop Adaptation Area*
Don	1,4[N],5,6,7
Jerry[PVP]	Statewide
Troy	1,2,4[N],6,7
Valley	1,2,4[N]

Acceptable/Promising:

Variety	*Crop Adaptation Area*
Newdak[PVP]	1,2,7
Settler	Statewide

SPRING BARLEY

Recommended:

Variety	*Crop Adaptation Area*
6 Row	
Excel[PVP]	1,2,4,6,7
Robust[PVP]	1,2,4,6,7
Stander[PVP]	Statewide
Foster	Statewide
2 Row	
Stark	Statewide
Logan	1,4[N],6,7

Acceptable/Promising:

Variety	*Crop Adaptation Area*
2 Row	
Bowman	Statewide
Conlon[PVP]	1,4[N],6,7

Excel, Foster, Robust and Stander are approved American Malting Barley Association varieties.

[PVP] U.S. Plant Variety Protection applied for and/or issued; seed sales of these varieties are restricted to classes of certified seed.

[N] Northern half of crop adaptation area.

Source - Small Grains 1998 Variety Recommendations, EC744.

OAT VARIETY TRAILS

Objective: To evaluate standard and experimental oat varieties for yield, agronomic characteristics and adaptation to western South Dakota.

Procedure: Plots were seeded at two locations in April 1997 with a John Deere 610 plot drill with 10 inch spacing. All locations were fallow the previous year. The experimental design was a randomized complete block with four replications. A seeding rate of 1,390,000 seeds per acre (64 Lb/A) was used and liquid starter fertilizer (10-34-0 at 6.3 gal/A) applied at 7.4-25-0 pounds per acre. Herbicides were applied in early June and varied according to weeds present. Plots were trimmed to 5' x 25' after heading. The oats were harvested in July and August with a small plot combine. Height, shatter, and lodging notes were taken at the time of harvest.

Location Summaries

Plots not Harvested

Location	Reason
Perkins County – Bison	Hail

Pennington County - Wall

Planted: April 1, 1997
Harvested: July 28, 1997

Herbicide: Bronate (16 oz/A), June 6.
Additional Nitrogen: None

Oat yields were excellent this year at Wall. The trial averaged 88.5 Bu/A with some varieties averaging near 100 Bu/A. Test weights were also good averaging 39.5 Lb/Bu. Newdak, Troy, Valley, Jerry and Jim were good varieties in 1997. Varieties with good two year ('95 & '97) averages were Newdak, Jerry, Troy and Valley. Results are presented in Table 11.

Table 11. Oat Variety Trial - Pennington County (Wall), 1995-97.

Variety	Height Inches	Lodging 1-5*	Test Wt. Lb/Bu	Yield Bu/A 1997	Yield Bu/A 1995, 97**
Don	30.8	1.0	38.9	90.8	76.0
Gem	29.8	1.3	38.6	89.6	--
Hytest	33.0	1.8	42.8	80.1	62.8
Jerry	31.3	1.3	39.9	92.8	80.3
Jim	29.5	1.3	39.2	91.1	71.7
Newdak	28.0	1.0	37.7	99.1	85.4
Settler	28.5	1.8	38.7	85.1	74.9
Troy	31.0	1.8	38.8	99.1	82.1
Valley	26.8	1.0	40.8	98.5	88.5
Otee	28.3	1.3	39.7	77.3	--
ND 880107 EXP	33.3	1.5	37.9	91.8	--
SD 92125 EXP	27.5	2.0	39.5	76.2	--
SD 92057 EXP	29.3	2.0	41.0	81.3	--
SD 93055 EXP	32.5	1.8	39.1	80.0	--
SD 93269 EXP	28.5	1.0	40.0	88.1	--
SD 93311 EXP	29.8	1.3	39.0	95.2	--
AVERAGE	29.8	1.4	39.4	88.5	77.7
LSD (.05)	3.23	0.63	1.16	11.62	--
CV	7.58	31.15	2.05	9.19	--

* 1 = No Lodging, 5 = >80% lodged.
** Two year average of 1995 & '97.
EXP Experimental varieties.

SPRING BARLEY VARIETY TRIALS

Objective: To evaluate standard and experimental spring barley varieties for yield, agronomic characteristics and adaptation to western South Dakota.

Procedure: Plots were seeded at three locations in April 1997 with a John Deere 610 plot drill with 10 inch spacing. All locations were fallow the previous year. The experimental design was a randomized complete block with four replications. A seeding rate of 1,210,000 seeds per acre (117 Lb/A for two row, 83 Lb/A for six-row) was used and liquid starter fertilizer (10-34-0 at 6.3 gal/A) applied at 7.4-25-0 pounds per acre. Herbicides were applied in early June and varied according to weeds present. Plots were trimmed to 5' x 25' after heading. The wheat was harvested in July and August with a small plot combine. Height, shatter, and lodging notes were taken at the time of harvest.

Location Summaries

Plots not Harvested

Location	Reason
Perkins County - Bison	Hail

Pennington County - Wall

Planted: April 1, 1997
Harvested: July 28, 1997

Herbicide: Bronate (16 oz/A), June 6.
Additional Nitrogen: None

Yields at Wall were good considering the cool and very wet conditions in July. Yields averaged 45.6 Bu/A and test weights 48.3 Lb/Bu. The varieties Logan, Stark and Foster had the best yields in 1997 and the best two year averages. Results are shown in Table 12.

Harding County - Ralph

Planted: April 29, 1997
Harvested: August 19, 1997

Herbicide: Ally ($^1/_{10}$ oz/A) + 2,4-D (8 oz/A LV-4) + Assert (1 pint/A), June 18.
Additional Nitrogen: None

Growing conditions for barley were excellent at Ralph in 1997. The average yield was 60.6 Bu/A with test weights averaging 48.5 Bu/A. 1997 top yielders were Stark, Excel and Stander. Barley was not grown at this location for several years so there are no three year averages for Ralph. Results are presented in Table 13.

Table 12. Spring Barley Variety Trial - Pennington County (Wall), 1995-97.

Variety	Type	Height Inches	Lodging 1-5 *	Test Wt. Lb/Bu	Yield Bu/A 1997	Yield Bu/A 1995, 97**
Bowman	2 row	26.5	1.0	50.7	41.9	38.0
Conlon	2 row	26.3	1.3	48.3	46.6	--
Logan	2 row	27.3	1.0	50.7	56.1	43.7
Stark	2 row	28.0	1.3	50.5	54.3	44.5
Excel	6 row	24.5	1.3	46.3	43.3	38.8
Foster	6 row	25.8	1.0	46.6	52.5	48.0
MN 85	6 row	26.3	1.5	47.4	42.8	--
Robust	6 row	26.3	1.5	48.2	41.9	35.1
Stander	6 row	24.3	1.0	48.1	42.2	35.6
Merlin	waxy	29.8	1.3	46.1	34.5	--
AVERAGE		26.4	1.2	48.2	45.6	40.5
LSD (.05)		3.50	0.53	1.28	8.63	--
CV		9.10	30.43	1.83	13.04	--

* 1 = no lodging, 5 = > 80% lodged.
** Two year average of 1995 &'97.

Table 13. Spring Barley Variety Trial - Harding County (Ralph), 1997.

Variety	Type	Height Inches	Lodging 1-5 *	Test Wt. Lb/Bu	Yield Bu/A
Bowman	2 row	20.8	1.0	50.8	43.6
Conlon	2 row	22.3	1.0	49.6	60.1
Logan	2 row	20.5	1.0	51.7	59.9
Stark	2 row	21.8	1.0	50.3	65.8
Excel	6 row	21.0	1.0	46.2	65.5
Foster	6 row	20.3	1.0	46.3	61.8
MN 85	6 row	25.0	1.0	46.3	62.8
Robust	6 row	22.8	1.0	47.2	58.9
Stander	6 row	22.0	1.0	46.4	72.1
Merlin	waxy	20.3	1.0	53.7	55.4
AVERAGE		21.6	1.0	48.8	60.6
LSD (.05)		2.59	0.00	1.86	7.66
CV		8.23	0.00	2.62	8.71

* 1 = no lodging, 5 = > 80% lodged.

SAFFLOWER VARIETY TRIAL

Objective: To evaluate safflower varieties for yield and adaptation to western South Dakota.

Procedure: Ten varieties were planted at 25 Lb/A in a randomized complete block experiment with four replications near Wall and Oelrichs, South Dakota. The previous year was fallow. The plots were planted in April with a John Deere 610 drill set to 20-inch row spacing. The plots were harvested in September with a small plot combine. Results are shown in tables 14 and 15.

Pennington County - Wall

Planted: April 25, 1997
Harvested: September 3, 1997

Herbicide: Treflan granules 1 Lb/A active ingredient fall applied, spring incorporated
Additional Nitrogen: None

Fall River County - Oelrichs

Planted: April 23, 1997
Harvested: September 24, 1997

Herbicide: $^{2}/_{10}$ oz. Harmony; 1 ½ Pints Poast + crop oil.
Additional Nitrogen: None

Discussion: It was not a good year for safflower production in southwestern South Dakota in 1997. The weather in May and June was favorable with warm temperature and normal precipitation, which allowed for good plant growth. But in July and the first part of August conditions were very wet and humid. This promoted substantial alternaria leaf spotting disease, which caused the plants to shut down grain fill before normal. Most seeds were empty or only partially filled as can be noted by the very low test weights averaging 27 and 31 Lb/Bu. The only variety to be even close to marketable test weight was Finch, a white variety normally grown for the birdseed market. Because of the poor weather and test weights, yields were also limited to an average of 544 Lb/A at Wall and 783 Lb/A at Oelrichs. However the oil contents were good considering the very light test weights.

Table 14. Safflower Variety Trial – Pennington County (Wall) 1997.

Variety	Oil Type	Oil Content Percent	Test Wt. Lb/Bu	Yield Lb/A
Montola 2000	oleic	36.1	29.4	432
Montola 2001	oleic	34.8	28.5	313
S-317	oleic	39.4	32.2	644
S-518	oleic	37.3	30.3	715
CalWest 88-OL	oleic	37.9	31.5	632
Centennial	linoleic	36.4	30.7	448
Morlin	linoleic	37.2	32.3	574
Finch	linoleic	35.4	36.4	503
S-208	linoleic	33.9	29.4	675
S-541	linoleic	38.9	30.9	507
Average		36.7	31.1	544
LSD (P=.05)		--	1.93	184.1
CV		--	4.27	23.3

Table 15. Safflower Variety Trial – Fall River County (Oelrichs) 1997.

Variety	Oil Type	Oil Content Percent	Test Wt. Lb/Bu	Yield Lb/A
Montola 2000	oleic	33.4	26.4	744
Montola 2001	oleic	30.9	22.8	542
S-317	oleic	34.2	27.0	945
S-518	oleic	29.3	22.8	536
CalWest 88-OL	oleic	29.7	25.0	760
Centennial	linoleic	34.3	26.8	590
Morlin	linoleic	34.9	32.7	970
Finch	linoleic	35.0	36.2	1457
S-208	linoleic	24.8	22.9	586
S-541	linoleic	34.7	27.4	701
Average		32.1	27.0	783
LSD (P=.05)		--	2.76	203.08
CV		--	7.06	17.87

FIELD PEA VARIETY TRIALS

Objective: To evaluate field pea varieties for yield and adaptation to western South Dakota.

Procedure: Field peas were planted in a randomized complete block experiment with four replications near Selby, Wall, Bison and Ralph, South Dakota. The Wall and Selby trial had sixteen entries, the Ralph and Bison trial had five entries. A seeding rate of 300,000 seeds/A (85 - 165 Lb/A) was used and liquid starter fertilizer (10-34-0 at 6.3 gal/A) applied at 7.4-25-0 pounds per acre. The peas were inoculated with a peat based inoculum just prior to planting. A John Deere 610 drill with 10 inch spacing was used to plant the trials in April 1997. The peas were harvested for grain in August with a Wintersteiger small plot combine equipped with vine lifters and a pickup reel. The results are given in Tables 17 - 19. Table 16 shows variety characteristics.

Location Summaries:

Plots not Harvested

Location	Reason
Perkins County – Bison	Hail

Location Information

	Selby	Wall	Ralph
Planted:	4/30	4/25	5/8
Harvested:	8/ 6	7/25	8/25
Herbicide:	Pursuit 3 oz/A	Treflan granules fall applied	Pursuit 3 oz/A

Summary: The favorable rainfall at Selby resulted in very good yields averaging 39.4 Bu/A. The top yield group was comprised of Carneval, Maja, Totem, Highlight, Majoret, Espace and Atomic. These are all semi-leafless short-vine types, which would be expected to perform better in this part of the state. Yields at Wall averaged 20.9 Bu/A, which is very consistent with past years, yields. Arvika, Grande, Highlight and Carneval were the top yield group. At Ralph yields were lower than in the past which may be due to the application of Methyl Bromide two years ago on this spot. The average yield was only 9.5 Bu/A and the varieties Austrian winter and Arvika did the best. In the western part of the state the normal leaf; long vine types are the best choice. They are typically more drought tolerant and more indeterminate in their flowering.

Table 16. Field Pea Characteristics.

Variety	Maturity	Leaf type	Vine Length	Seed Size
Yellow cotyledon				
Trapper	Late	Normal	Long	Small
Grande	Med-Late	Normal	Long	Medium
Carneval	Medium	Semi-Leafless	Short-Med	Med-Small
Profi	Early-Med	Semi-Leafless	Short	Medium
Highlight	Early-Med	Semi-Leafless	Short-Med	Small-Med
Integra	Early	Semi-Leafless	Short-Med	
Aladin	Early	Semi-Leafless	Med-Short	Large
Maja	Early	Semi-Leafless	Short	Med-Large
Mustang	Medium	Semi-Leafless	Short	
Green cotyledon				
Totem	Med-Early	Semi-Leafless	Short-Med	
Radley	Early-Med	Semi-Leafless	Short-Med	Small
Majoret	Early	Semi-Leafless	Short-Med	Med-Large
Espace	Early	Semi-Leafless	Short-Med	Large
Atomic	Early	Semi-Leafless	Short-Med	V. Large
Forage				
Arvika	Late	Normal	Long	Small

Table 17. Field Pea Variety Trial - Pennington County (Wall), 1995-97.

Variety	Height Inches	Shatter 1-5*	Lodging 1-5**	Test Wt. Lb/Bu	Yield 1997	Bu/A 1995-97
Arvika	24	1	5	62.0	25.8	22.6
Trapper	20	1	5	62.5	19.3	19.0
Grande	25	1	5	61.2	26.9	--
Aladin	24	1	2	61.0	21.2	--
Maja	17	1	2	61.0	21.1	--
Integra	23	1	1	60.0	20.1	--
Profi	22	1	3	60.0	21.2	23.1
Highlight	21	1	3	62.0	23.4	--
Carneval	26	1	3	60.5	23.2	--
Mustang	18	1	4	60.0	17.5	--
Totem	20	1	5	61.4	15.4	--
Majoret	22	1	3	61.5	20.2	--
Espace	20	2	2	60.5	19.4	--
Atomic	20	3	3	61.3	21.9	--
Radley	20	1	5	61.6	18.3	16.8
Austrian Winter	20	1	5	62.9	19.7	--
Grand Mean	21.3	1.2	3.5	61.2	20.9	20.4
LSD (P=.05)	--	--	--	1.25	4.03	--
CV	--	--	--	1.43	13.50	--

* 1=No shatter, 5=Mostly shattered.
**1=No lodging, 5= >80% lodged.

Table 18. Field Pea Variety Trial - Walworth County (Selby), 1997.

Variety	Test Wt. Lb/Bu	Yield Bu/A
Arvika	61.4	29.8
Trapper	62.8	30.4
Grande	63.1	40.4
Aladin	62.0	31.1
Maja	61.4	47.6
Integra	61.9	38.7
Profi	62.2	38.8
Highlight	63.1	45.3
Carneval	63.5	49.5
Mustang	61.8	38.6
Totem	61.2	46.8
Majoret	62.9	42.7
Espace	61.1	43.5
Atomic	62.1	44.6
Radley	62.4	39.8
Austrian Winter	61.6	22.6
Grand Mean	62.1	39.3
LSD (P=.05)	1.11	7.22
CV	1.26	12.82

Table 19. Field Pea Variety Trial - Harding County (Ralph), 1995-97.

Variety	Test Wt. Lb/Bu	Yield Bu/A 1997	Yield Bu/A 1995-97
Austrian Winter	62.9	14.0	--
Arvika	61.4	10.3	20.6
Trapper	62.6	7.8	18.9
Profi	61.0	7.3	19.1
Radley	60.8	8.1	13.9
AVERAGE	61.7	9.4	18.1
LSD (.05)	1.66	2.82	NA
CV	1.70	19.30	NA

CHICKPEA VARIETY TRIAL

Objective: To evaluate chickpea varieties for yield and adaptation to western South Dakota.

Procedure: Four varieties of chickpeas were in a randomized complete block experiment with four replications near Wall and Oelrichs, South Dakota. Three of the varieties are kabuli types, which are grown for the large seeded garbanzo bean salad bar market. The other variety (Myles) is a desi type, which accounts for 90% of the market outside the United States and is grown as a protein source for humans and livestock. Kabuli types used a planting rate of 150 Lb/A (~3 seeds ft^2) Desi types 90 Lb/A (~4 seeds ft^2). The previous year was fallow. The plots were planted in April with a John Deere 610 drill set to 20-inch row spacing at Oelrichs and 10-inch spacing at Wall. The plots were harvested in September and October with a small plot combine. Results are shown in tables 20 and 21.

Pennington County - Wall

Planted: April 25, 1997
Harvested: September 3, 1997

Herbicide: Treflan granules 1 Lb/A active ingredient fall applied, spring incorporated
Additional Nitrogen: None

Fall River County - Oelrichs

Planted: April 23, 1997
Harvested: October 16, 1997

Herbicide: 1 ½ Pints Poast + crop oil.
Additional Nitrogen: None

Discussion: Because of weather conditions, chickpeas did not do well southwestern South Dakota in 1997. The weather in May and June was favorable with warm temperature and dry conditions, which allowed for good plant growth. But in July and the first part of August conditions were very wet and humid. This caused substantial leaf disease and also made the plants mature unevenly. The wet weather also caused quite a bit of seed discoloration and germination in the pods on the kabuli types. This would greatly affect their market price, good quality chickpeas were worth $.18 - .20/Lb but discolored seed would go to the feed market at $.05/Lb. Yields at Oelrichs were respectable averaging 1300 Lb/A, while at Wall yields were less at 700 Lb/A. Chickpeas are well adapted to the dry semi-arid climate of South Dakota and probably would have done much better with out the excessive rainfall in July.

Table 20. Chickpea Variety Trial – Pennington County (Wall) 1997.

Treatment Name	Test Wt Lb/Bu	Yield Lb/A
Dwelley (kabuli)	58.2	874
Evans (kabuli)	58.9	581
Sanford (kabuli)	59.6	825
Myles (desi)	54.8	547
Grand Mean	57.8	706
LSD (P=.05)	1.52	338.7
CV	1.32	23.98

Table 21. Chickpea Variety Trial – Fall River County (Oelrichs) 1997.

Treatment Name	Test Wt Lb/Bu	Yield Lb/A
Dwelley (kabuli)	54.2	1634
Evans (kabuli)	55.0	1044
Sanford (kabuli)	54.6	1198
Myles (desi)	50.9	1331
Grand Mean	53.6	1301
LSD (P=.05)	1.2	563.2
CV	1.12	21.65

PROSO MILLET VARIETY TRIAL

Objective: To evaluate standard and experimental proso millet varieties for yield, agronomic characteristics and adaptation to western South Dakota.

Procedure: This test was done in cooperation with Dr. David Baltensperger (millet breeder) and Glen Frickel from the University of Nebraska. Thirteen varieties were planted in a randomized complete block experiment with four replications near Martin, South Dakota. The millet was planted into 5' x 25' plots on June 16, 1997 with a John Deere 750 plot drill with ten inch spacing. The ground was wheat the previous year and was sprayed with Roundup prior to planting. Nebraska personnel harvested the Martin trial with a small plot combine. The results for Martin are presented in the table below.

Discussion: The cooperation between the two Universities made this test possible. By SDSU personnel planting and University of Nebraska people harvesting, resources could be better utilized. It gave us a chance to look at new varieties and the Nebraska millet breeder a trial in an area in South Dakota where millet is grown.

The trial at Martin was highly variable this year; part of the plot had poor seed set and a high amount of lodging possibly related to European corn borers. Because of these problems some of the plot was not harvested and the results *should not* be used for variety comparisons.

Table 22. Proso Millet Variety Trial - Bennett County (Martin), 1997.

Variety	Height Inches	Seed Size Seeds/5g	Test Wt. Lb/Bu	Yield Lb/A
Abarr	42	727	55.9	1140
Cope	47	744	57.4	1090
Dawn	40	759	56.2	1280
Earlybird	41	714	55.5	1370
Huntsman	46	735	57.6	1280
Minco	46	770	56.6	1470
Minsum	47	734	56.3	930
NE 1	42	795	56.8	960
Panhandle	46	788	56.8	1210
Rise	45	797	57.0	1650
Snowbird	45	747	56.9	1640
Sunrise	43	705	57.2	1570
Sunup	45	771	57.7	1630
Average	44	753	56.8	1325
LSD .05	4.1	32	0.9	410

GRAIN SORGHUM PLANTING DATES & YIELD TRIAL

Objective: To evaluate grain sorghum hybrids for yield and adaptation to western South Dakota and the effect of two different planting dates on grain sorghum yield.

Procedure: Fifteen grain sorghum hybrids were planted on two dates (May 15 & June 6) in a randomized complete block experiment with four replications near Sturgis, South Dakota. A seeding rate of 58,000 seeds per acre (plus one entry at 75,000/A for comparison) was used and liquid starter fertilizer (10-34-0 at 6.3 gal/A) applied at 7.4-25-0 pounds per acre. The May 15 date was planted with a John Deere 610 drill with ten inch spacing and the June 6 date with a John Deere 750 drill with the same spacing. Flowering dates (50% of the plot bloomed) were taken weekly in July and August, with height and lodging note taken at the time of harvest. Both dates were harvested on October 15 with a small plot combine.

Discussion: As can be seen by the results shown in Tables 23 and 24, there was quite a bit of variation in this trial. This was due mainly to weed pressure and to uneven spacing of the plants in a plot. It is difficult to get even spacing with our plot drill at low populations. The high CV's don't allow for much comparisons between hybrids, but as a rule the earlier maturing ones did better than the later ones. There also wasn't much difference in yields between the two dates partly due to the warm weather in September that allowed the second date to mature. Test weights dropped from an average of 55.1 Lb/Bu on the early date to 51.7 Lb/Bu on the later date, showing that even with the favorable weather the June 6 planting date had a shorter grain filling period.

Table 23. Grain Sorghum Yield Trial, May 15 planting date – Meade (Sturgis) 1997.

Variety	50% Bloom Date	Height Inches	Lodging 0-9*	Test Wt. Lb/Bu	Yield Bu/A
Agripro AP9135	Aug 10	42.5	0.5	53.8	55.0
Agripro AP2140	Aug 12	44.5	0.5	55.5	62.2
Agripro AP2233	Aug 20	42.0	0.0	49.8	25.3
Agripro EXP71005	Aug 1	49.0	1.0	55.7	45.0
Pioneer 8950	Aug 3	40.0	0.0	56.3	43.2
Pioneer 8925	Aug 6	41.5	0.0	57.1	49.1
Pioneer 8875	Aug 11	45.0	0.0	54.5	66.4
Pioneer EXP87657	Aug 12	43.5	0.0	48.4	60.1
Dekalb DK18	Jul 30	45.0	0.0	55.6	50.1
Dekalb DK27	Aug 8	43.0	0.0	57.7	53.0
Dekalb DK28E	Aug 13	41.0	0.0	55.5	47.9
NC+ 4R48	Jul 30	46.0	1.5	56.1	38.2
NC+ 155	Aug 8	40.0	0.5	56.5	56.4
NC+ 5C35	Aug 13	43.5	0.0	56.4	51.5
Novartis NK 251	Jul 31	38.5	1.5	59.1	47.9
Novartis NK KS310	Aug 10	42.5	0.0	50.5	46.2
Novartis NK K35-Y5	Aug 15	42.0	0.0	55.1	30.7
Novartis NK 251 75,000 seeds/A	Jul 31	38.0	1.0	58.8	58.3
Average		42.6	0.4	55.1	49.2
LSD (P=.05)		3.45	1.05	2.07	14.63
CV		3.84	138.46	2.66	21.01

* 0= No lodging, 9= > 90% lodged.

Table 24. Grain Sorghum Yield Trial, June 6 planting date – Meade (Sturgis) 1997.

Variety	50% Bloom Date	Height Inches	Lodging 0-9*	Test Wt. Lb/Bu	Yield Bu/A
Agripro AP9135	Aug 12	43.5	0.5	47.3	61.5
Agripro AP2140	Aug 15	45.5	0.0	53.5	58.6
Agripro AP2233	very late	42.5	0.0	45.3	19.9
Agripro EXP71005	Aug 10	46.0	0.0	54.6	38.7
Pioneer 8950	Aug 10	41.0	0.0	54.4	46.5
Pioneer 8925	Aug 11	39.5	0.0	56.6	40.7
Pioneer 8875	Aug 16	43.5	0.0	46.7	33.0
Pioneer EXP87657	Aug 20	45.0	0.0	44.4	42.1
Dekalb DK18	Aug 8	44.0	0.0	50.4	51.6
Dekalb DK27	Aug 15	44.0	0.0	54.4	54.4
Dekalb DK28E	Aug 15	39.5	0.0	55.4	59.6
NC+ 4R48	Aug 8	46.5	0.0	53.4	43.6
NC+ 155	Aug 12	42.5	0.0	53.3	49.7
NC+ 5C35	Aug 15	45.0	0.0	52.3	42.6
Novartis NK 251	Aug 10	39.0	0.0	56.3	58.9
Novartis NK KS310	Aug 18	44.0	0.0	45.8	44.7
Novartis NK K35-Y5	Aug 15	43.0	0.0	48.5	38.6
Novartis NK 251 75,000/A	Aug 10	39.5	1.0	58.0	65.9
Average		43.0	0.1	51.7	47.3
LSD (P=.05)		4.53	0.80	3.22	14.31
CV		5.00	457.62	4.40	21.42

* 0= No lodging, 9= > 90% lodged.

SDSU REDUCED TILLAGE CROP ROTATION STUDY
WALL, SOUTH DAKOTA 1997

Objectives: To evaluate the economic returns from the total crop rotation each year.

Funding: The South Dakota Wheat Commission and the South Dakota Oil Seeds Council have shared the funding on this crop rotation study.

Cooperator: Crown Partnership of Wall, South Dakota.

Procedures: The study with the 11 different rotations was established in the spring of 1994. The rotations are 2 to 4 years in duration and we will be completing one cycle in 1998. All the crops in each rotation are grown each year and the rotations are replicated 4 times at this location. Reduced and no-till production practices are used to grow the crops in the rotations. The corn, millet, peas, spring wheat and winter wheat were planted no-till into millet stubble. The safflower and sunflower plots had 1 fall and 1 spring tillage to incorporate the treflan herbicide. The crop yields were taken from each plot and used to compute the average yields for each rotation. The crop yields are beginning to reflect the effects of the rotations and the data is becoming more meaningful each season. Detailed field notes are recorded for each rotation and used in calculating the cost of production. An economic return is calculated for each season as well as long term averages.

Rotations and Crop Yields:

1	Winter Wheat *	/	Fallow					
	32.9 bu							
2	Winter Wheat	/	Sunflower	/	Millet			
	36.1 bu		1885 lbs		2796 lbs			
3	Winter Wheat	/	Safflower	/	Millet			
	33.5 bu		1010 lbs		2752 lbs			
4	Winter Wheat	/	Millet					
	24.4 bu		2781 lbs					
5a	Winter Wheat	/	Corn	/	Sunflower	/	Spring Wheat	
	31.7 bu		86.8 bu		1822 lbs		41.7 bu	
6a	Winter Wheat	/	Safflower	/	Chickpeas	/	Spring Wheat	
	26.8 bu		936 lbs		529 lbs		47.8 bu	
7	Winter Wheat *	/	Corn	/	Fallow			
	41.3 bu		82.6 bu					
9a	Winter Wheat *	/	Safflower-C	/	Clover Fallow	/	Winter Wheat *	
	30.1 bu		1167 lbs				42.7 bu	
10	Winter Wheat	/	Peas	/	Millet			
	35.4 bu		1306 lbs		3642 lbs			
11	Winter Wheat	/	Corn	/	Millet			
	27.6 bu		85.2 bu		2309 lbs			

Note: * signifies that Butte 86 was seeded back into failed winter wheat.

Rotation 1
WINTER WHEAT / SUMMER FALLOW

Cost / A.	1997 Winter Wheat
25.57	-Plant to Nekota(75#/A rate)w/JD610 drill at 12" rows + 6 gal/A liquid 10-34-0. Seed treated w/5 oz/100 lbs Vitavax, Thiram, RTU on Sept.28,96
35.50	-Spray 32-0-0 liquid Nitrogen fertilizer on dormant winter wheat at 115#N / Acre rate. March 26,97
9.07	-Sprayed w/16 oz Roundup Ultra + 50 ml/gal liquid Ammonium Sulfate. 8 gallon/Acre spray rate. On March 31,97
17.00	-Planted to Butte 86 w/ JD 610 drill @ 90#/Acre. No seed treatment or fertilizer added.
11.94	-Spray w/1 pint Dakota + 2 oz Banvel 4L 10 gallon / acre spray rate. - May 15,97
14.58	-Harvest 32.9 bu / acre spring wheat – August 7,97 Test weight – 59.1# / bushel
.40	-Soil Sampling
25.00	-Land Charges 1997
139.06	Total Cost of Winter Wheat Production

Rotation 1
WINTER WHEAT / *SUMMER FALLOW*

Cost / A.	1997 Summer Fallow
10.27	-Spray w/12 oz/A Roundup Ultra + 50 ml/gal Ammonium Sulfate + 4 oz Banvel/A 8 gpa rate. - Aug. 7, 96 (prior to seeding)
4.25	-worked fallow ground w/ chisel points & rod-weeder -Sept. 10, 96
10.22	-Spray w/ 12 oz Roundup Ultra + 50 ml/gal Ammonium Sulfate + ¾ pound active ingredient Atrazine 90 DF. 8 gallon/acre spray rate 8 gpA – Oct. 22, 96.
4.25	-Work plots w/12" sweeps & no rod weeder. – June 18,97
4.25	-Work plots w/12" sweeps with rod weeder. – July 15,97
25.00	-Land Charges 1997
58.24	Total Cost of Summer Fallow

Rotation 1 SUMMARY 1997

Crop	Income	Expenses	Net Income Per Acre
Winter Wheat as HRS	115.15	139.06	- 23.91
Fallow	0.00	58.24	- 58.24
	$115.15	$197.30	$ - 82.15 / 2 = $ - 41.08

$ - 41.08 Average Income / acre for Rotation 1 - 1997

Rotation # 1: Winter Wheat / Fallow

The winter wheat / fallow rotation is a standard rotation to compare with the more intensive rotations. The economic returns for this rotation in 1995 were good with an average wheat yield of 67 bushels per acre and a price of $4.46 per bushel. The 1996 and 1997 crops were not as good because the winter wheat was lost to winterkill and had to be replanted to spring wheat. The long term average return for this rotation is about a plus 10 dollars per acre excluding the farm program payments. The 1997 crop had an average loss of 41 dollars per acre due to the increased cost of replanting, lower spring wheat yields and low price per bushel.

Rotation 2
WINTER WHEAT / Sunflower / Millet

Cost / A.	1997 Winter Wheat
10.27	-Spray w/ 12 oz/A Roundup Ultra + additives + Banvel at 4 oz/A 8 gpA spray rate. - Aug 7,96
25.35	-Fertilize w/ JD750 drill at 80# N in form of 32-0-0 liquid Nitrogen fertilizer on October 7,96
27.14	-Plant to Nekota(90#/A rate)w/JD750 drill at 10" rows + 6 gal/A liquid 10-34-0. Seed treated w/5 oz/100 lbs Vitavax Thiram RTU. – October 8,96
12.24	-Spray w/.4 oz Harmony Extra + 8 oz LV4 + 18 ml Penetrate + 3 oz Banvel 4L/A at 8 gpa rate. -May 9,97
15.22	-Harvest 36.1 bu / acre winter wheat – on August 7,97 Test weight – 58.1# / bushel
.40	-Soil Sampling
25.00	-Land Charges 1997
115.62	Total Cost of Winter Wheat Production

Rotation 2
WINTER WHEAT / *SUNFLOWER* / MILLET

Cost / A.	1997 Sunflowers
13.00	-Apply 1# ai TR-10 granules and under-cut w/24" sweeps. - Oct.23,96
19.10	-Spray on 28-0-0 liquid Nitrogen fertilizer (60#N/Acre).-April 24,97
9.07	- Spray w/ 16 oz Roundup Ultra + Liquid Ammonium Sulfate at 50 ml/gallon at 8 gallon/acre spray rate.-April 25,97
4.25	-Disk to final incorporate TR:10 granules. - April 25,97.
22.82	-Plant to Yukon (oil-type size #4 sunflowers w/JD 750 drill, 24" rows(13.8" spacing)+ 6 gpA 10-34-0. Seed planted at 18,900 seeds/acre to achieve 18,000 plant population. 95% germ.
14.72	-Sprayed w/Cyclone @ 2 pints/Acre plus 18 ml/gal Penetrate. Sprayed at 19.2 gallons/acre spray rate.- on June 2,97
13.10	-Sprayed w/ Lorsban 4E at 1 ½ pints/acre at 10 gallons / acre spray rate. on June 10,97.
25.14	-Harvest 1885# / Acre Sunflowers – October 6,97. Test weight – 30.8# / bushel
.40	-Soil Sampling
25.00	-Land Charges 1997
146.60	Total Cost of Sunflower Production

Rotation 2
WINTER WHEAT / SUNFLOWER / *MILLET*

Cost / A.	1997 Millet
10.22	-Spray w/12 oz Roundup Ultra + 50 ml/gallon Ammonium Sulfate + Aatrex 90df @ ¾# ai/A. 8 gallon per acre spray rate. – October 22,96
19.10	-Spray on 28-0-0 liquid Nitrogen fertilizer (60#N/Acre).-April 24,97
10.31	-Spray w/16 oz Roundup Ultra + 75 grams/gallon ammonium sulfate crystals+ 2 oz Banvel 4L / A. Sprayed at 8 gallons per acre spray rate. On June 2,97.
19.22	-Planted to Sunup millet w/JD750 drill. w/ starter fertilizer(10-34-0) at 6 gal/Acre. Row spacing was at 10". Seeding rate was at 20#/A. - June 3,96
19.18	-Harvest 2796# / acre Millet – September 2,97
.40	-Soil Sampling
25.00	-Land Charges 1997
103.43	Total Cost of Millet Production

Rotation 2 SUMMARY 1997

Crop	Income	Expenses	Net Income Per Acre
Winter Wheat	117.33	115.62	1.71
Sunflower	179.08	146.60	32.48
Millet	125.82	103.43	22.39
	$422.23	$365.65	$56.58 / 3 = $18.86

$ 18.86 Average Income / acre for Rotation 2 - 1997

Rotation #2: Winter Wheat / Sunflower / Millet

This is an intense rotation that provides excellent diversity of crops. The winter wheat is a cool season grass, the sunflower is a warm season broadleaf and the millet is warm season grass. The rotation had lower economic returns in 1995 and 1996 due to loss of stand of the sunflower to insects just after planting. The winter wheat yields planted after millet in 1997 was 36 bushels per acre compared to 24 bushels per acre of the winter wheat planted after millet in rotation 4. The additional 12 bushels per acre can only be attributed to the broadleaf crop in the rotation two years prior to the winter wheat crop. However with the lower wheat prices the net return from the wheat crop in this rotation was only about 2 dollars per acre without the farm program benefits. The sunflower and the millet both had good economic returns that improved the average return to about 19 dollars per acre.

Rotation 3

WINTER WHEAT / SAFFLOWER / MILLET

Cost / A.	1997 Winter Wheat
10.27	-Spray w/ 12 oz/A Roundup Ultra + additives + Banvel at 4 oz/A 8 gpA spray rate. - Aug 7,96
25.35	-Fertilize w/ JD750 drill at 80# N in form of 32-0-0 liquid Nitrogen fertilizer on October 7,96
27.14	-Plant to Nekota(90#/A rate)w/JD750 drill at 10" rows + 6 gal/A liquid 10-34-0. Seed treated w/5 oz/100 lbs Vitavax Thiram RTU. – October 8,96
8.98	-Spray w/.1 oz Ally + 8 oz LV4 + 18 ml Penetrate + 3 oz Banvel 4L/A at 8 gpa rate. - May 9,97
14.70	-Harvest 33.5 bu / acre winter wheat – on August 7,97 Test weight – 58.0# / bushel
.40	-Soil Sampling
25.00	-Land Charges 1997
111.84	Total Cost of Winter Wheat Production

Rotation 3

WINTER WHEAT / *SAFFLOWER* / MILLET

Cost / A.	1997 Safflowers
13.00	-Apply 1# ai TR-10 granules and under-cut w/24" sweeps. - Oct.23,96
20.25	-Spray on 32-0-0 liquid Nitrogen fertilizer (60#N/Acre).-March 26,97
4.25	-Worked w/12" sweeps to final incorporate TR:10 granules seal in nitrogen and loosen soil. March 26,97.
9.07	-Spray w/16 oz Roundup Ultra + liquid ammonium sulfate at 50 ml/gallon 8 gallons per acre spray rate. On April 25,97
4.25	-Disk to final incorporate TR:10 granules. - April 25,97.
29.72	-Plant to CalWest–88OL (high oleic) sunflowers w/JD 610 drill, 3-20" rows + 6 gallons per acre 10-34-0. Seeded at 30 pounds per acre. 80% germ.
21.50	-Reseeded to CalWest 88-OL at 30 pounds per acre due to crusting. No starter fertilizer used.
13.05	-Harvest 1010# / Acre Safflowers - Sept. 3,96 Test weight – 34.3# / bushel
.40	-Soil Sampling
25.00	-Land Charges 1997
140.49	Total Cost of Safflower Production

Rotation 3

WINTER WHEAT / SAFFLOWER / *MILLET*

Cost / A.	1997 Millet
10.22	-Spray w/12 oz Roundup Ultra + 50 ml/gallon Ammonium Sulfate + Aatrex 90df @ ¾# ai/A. 8 gallon per acre spray rate. – October 22,96
19.10	-Spray 28-0-0 liquid Nitrogen fertilizer added 60#N/Acre.-April 24,97
10.31	-Spray w/16 oz Roundup Ultra + 50 ml/gal liquid ammonium sulfate + 2 oz Banvel 4L / acre. Sprayed at 8 gallons per acre spray rate. On June 2,97.
19.22	-Planted to Sunup millet w/JD750 drill. w/ starter fertilizer(10-34-0) at 6 gal/Acre. Row spacing was at 10". Seeding rate was at 20#/A. - June 7,97
19.01	-Harvest 2752# / acre Millet – September 2,97
.40	-Soil Sampling
25.00	-Land Charges 1997
103.26	Total Cost of Millet Production

Rotation 3 SUMMARY 1997

Crop	Income	Expenses	Net Income Per Acre
Winter Wheat	108.88	111.84	-2.96
Safflower	40.40	140.49	-100.09
Millet	123.84	103.26	20.58
	$273.12	$355.59	$ - 82.47 / 3 = - 27.49

$ -27.49 Average Income / acre for Rotation 3 - 1997

Rotation #3: Winter Wheat / Safflower / Millet

This rotation is very similar in intensity and diversity to rotation 2. The rotation had an excellent return during 1995 and 1996. The 1997 safflower crop had lower yields due to leaf spotting diseases that occurred as a result of the heavy rains and high humidity during the summer months. The winter wheat crop had a net loss due to the lower wheat prices in 1997. The millet crop had a lower price this season but the increased yields made it the most profitable crop this season. The over-all rotation had a poor return due to the loss of the safflower crop to the leaf spotting diseases. This crop rotation still has one of the greatest potentials to increase economic returns in the drier regions of the state. The sunflower is better adapted to regions where more summer rains are received.

Rotation 4

WINTER WHEAT / MILLET

Cost / A.	1997 Winter Wheat
10.27	-Spray w/ 12 oz/A Roundup Ultra + 50 ml/gallon liquid ammonium sulfate + Banvel at 4 oz/A 8 gpA spray rate. - Aug 7,96
25.35	-Fertilize w/ JD750 drill at 80# N in form of 32-0-0 liquid Nitrogen fertilizer on October 7,96
27.14	-Plant to Nekota(90#/A rate)w/JD750 drill at 10" rows + 6 gal/A liquid 10-34-0. Seed treated w/5 oz/100 lbs Vitavax Thiram RTU. – October 8,96
8.98	-Spray w/.1 oz Ally + 8 oz LV4 + 18 ml Penetrate + 3 oz Banvel 4L/A at 8 gpa rate. - May 9,97
12.88	-Harvest 24.4 bu / acre winter wheat – on August 7,97 Test weight – 55.9# / bushel
.40	-Soil Sampling
25.00	-Land Charges 1997
110.02	Total Cost of Winter Wheat Production

Rotation 4

WINTER WHEAT / *MILLET*

Cost / A.	1997 Millet
10.22	-Spray w/12 oz Roundup Ultra + 50 ml/gallon liquid Ammonium Sulfate + Aatrex 90df @ ¾# ai/A. 8 gallon per acre spray rate. – October 22,96
19.10	-Spray 28-0-0 liquid Nitrogen fertilizer added 60#N/Acre.-April 24,97
10.31	-Spray w/16 oz Roundup Ultra + liquid ammonium sulfate + 2 oz Banvel 4L / acre. Sprayed at 8 gallons per acre spray rate. On June 2,97.
19.22	-Planted to Sunup millet w/JD750 drill. w/ starter fertilizer(10-34-0) at 6 gal/Acre. Row spacing was at 10". Seeding rate was at 20#/A. - June 7,97
19.12	-Harvest 2781# / acre Millet – September 2,97
.40	-Soil Sampling
25.00	-Land Charges 1997
103.37	Total Cost of Millet Production

Rotation 4 SUMMARY 1997

Crop	Income	Expenses	Net Income Per Acre
Winter Wheat	79.30	110.02	- 30.72
Millet	125.15	103.37	21.78
	$204.45	$213.39	$ - 8.94 / 2 = $ - 4.47

$ - 4.47 Average Income / acre for Rotation 4 - 1997

Rotation #4: Winter Wheat / Millet

This is a continuous crop of millet followed by winter wheat. This would be a good change for a producer to increase the intensity of his crop rotation. The survival of winter wheat planted into millet stubble was excellent during the winter of 1997. The winter wheat planted on fallow during this same period was lost due to winter injury. The producers in western South Dakota have used the millet stubble for planting winter wheat into in recent years. The millet stubble provides a uniformly warmer soil temperature than the winter wheat fields planted on fallow. This rotation works very well at first but if you note on the front page the yields of winter wheat grown in this rotation are less than the winter wheat yields grown in a rotation where safflower or sunflower was grown two years earlier. The long term rotations have more potential than this short rotation. A study conducted at Hayes, SD however for 6 years had this as the number one rotation for economic return because of the low input cost and a higher price for millet during this period of time.

Rotation 5a

WINTER WHEAT / CORN / SUNFLOWER / SPRING WHEAT

Cost / A.	1997 Winter Wheat
10.27	-Spray w/ 12 oz/A Roundup Ultra + 50 ml/gal liquid ammonium sulfate + Banvel at 4 oz/A 8 gpA spray rate. - Aug 7,96
25.35	-Fertilize w/ JD750 drill at 80# N in form of 32-0-0 liquid Nitrogen fertilizer on October 7,96
27.14	-Plant to Nekota(90#/A rate)w/JD750 drill at 10" rows + 6 gal/A liquid 10-34-0. Seed treated w/5 oz/100 lbs Vitavax Thiram RTU. – October 8,96
12.24	-Spray w/ .4 oz Harmony Extra + 8 oz LV4 + 18 ml Penetrate + 3 oz Banvel 4L/A at 8 gpa rate. - May 9,97
14.34	-Harvest 31.7 bu / acre winter wheat – August 7,97 Test weight – 58.8# / bushel
.40	-Soil Sampling
25.00	-Land Charges 1997
114.74	Total Cost of Winter Wheat Production

Rotation 5a

WINTER WHEAT / *CORN* / SUNFLOWER / SPRING WHEAT

Cost/A	1997 Corn
22.81	- Spray with ¾ # ai Aatrex 90 df + Lasso Micro-Tech at 2 ¾ quarts per acre. 10 gallons/acre spray rate. -March 31, 97.
24.33	-Spray on 28-0-0 liquid Nitrogen fertilizer (80#N/Acre).-April 24,97
9.07	-Spray w/ 16 oz Roundup Ultra + 50 ml/gal ammonium sulfate per gallon. 8 gallons per acre spray rate on April 25,97.
39.72	-Plant to Dekalb DK-417 (P26) . 91 day maturity. w/ JD 750 finger planter, 30" row spacing, seed spacing of 10.5" to achieve 20,000 plant population/acre. 10-34-0 starter fertilizer was added at 6 gallons per acre. April 28,97.
31.50	-Replanted to DK-417 due to crusting and poor stands. – May 16,97
25.36	-Harvest 86.8 bushels / acre corn on October 6,97 Test weight – 56.8# / bushel
.40	-Soil Sampling
25.00	-Land Charges 1997
178.19	Total Cost of Corn Production

Rotation 5a

WINTER WHEAT / CORN / *SUNFLOWER* / SPRING WHEAT

Cost / A.	1997 Sunflowers
13.00	-Apply 1# ai TR-10 granules and under-cut w/24" sweeps. - Oct.23,96
19.10	-Spray on 28-0-0 liquid Nitrogen fertilizer (60#N/Acre).-April 24,97
9.07	-Spray w/ 16 oz Roundup Ultra + Liquid Ammonium Sulfate at 50 ml/gallon at 8 gallon/acre spray rate.-April 25,97
4.25	-Disk to final incorporate TR:10 granules. - April 25,97.
22.82	-Plant to Yukon (oil-type size #4 sunflowers w/JD 750 drill, 24" rows(13.8" spacing)+ 6 gpA 10-34-0. Seed planted at 18,900 seeds/acre to achieve 18,000 plant population. 95% germ.
14.72	-Sprayed w/Cyclone @ 2 pints/Acre plus 18 ml/gal Penetrate. Sprayed at 19.2 gallons/acre spray rate.- on June 2,97
13.10	-Sprayed w/Lorsban 4E at 1 ½ pints/acre at 10 gallons/acre spray rate. on June 10,97.
24.56	-Harvest 1822# / Acre Sunflowers – October 6,97 Test weight – 30.5# / bushel
.40	-Soil Sampling
25.00	-Land Charges 1997
146.02	Total Cost of Sunflower Production

Rotation 5a

WINTER WHEAT / CORN / SUNFLOWER / *SPRING WHEAT*

Cost / A.	1997 Spring Wheat
10.27	-Spray w/ 12 oz/A Roundup Ultra + 50 ml/gal liquid ammonium sulfate + Banvel at 4 oz/A 8 gpA spray rate. - Aug 7,96
25.85	-Spray on liquid nitrogen in the form of 32-0-0 at 80# N / acre. - March 26,97
4.25	- Worked plots w/ 12" sweeps to seal in nitrogen and loosen soil. - March 26,97.
27.89	-Plant to Oxen (90#/A rate)w/JD750 drill at 10" rows + 6 gal/A liquid 10-34-0. Seed treated w/5 oz/100 lbs Vitavax Thiram RTU. – March 26,97
9.07	- Spray w/16 oz Roundup Ultra + 50 ml/gal liquid ammonium sulfate to kill cheatgrass. March 31,97.
11.94	-Spray w/ 1 pint Dakota + 2 oz Banvel 4L at 10 gallons per acre rate on May 15,97.
16.34	-Harvest 41.7 bu/a spring wheat – on August 7,97 Test weight – 56.0# / bushel
.40	-Soil Sampling
25.00	-Land Charges 1997
131.01	Total Cost of Spring Wheat Production

Rotation 5a SUMMARY 1997

Crop	Income	Expenses	Net Income Per Acre
Winter Wheat	103.03	114.74	-11.71
Corn	190.96	178.19	12.77
Sunflower	173.09	146.02	27.07
Spring Wheat	145.95	131.01	14.94
	$613.03	$569.96	$43.07 / 4 = $10.77

$ 10.77 Average Income / acre for Rotation 5a - 1997

Rotation #5a: Winter Wheat / Corn / Sunflower / Spring Wheat

This rotation was changed in the spring of 1997 to include two years of wheat followed by two years of crops other than wheat (Corn / Sunflower). It is difficult to make any statements about the economic comparisons with the limited amount of data available. The rotation looks like it may be too moisture intensive for the drier regions of the state.

Rotation 6a

WINTER WHEAT / SAFFLOWER / CHICKPEAS / SPRING WHEAT

Cost / A.	1997 Winter Wheat
10.27	-Spray w/ 12 oz/A Roundup Ultra + 50 ml/gal liquid ammonium sulfate + Banvel at 4 oz/A 8 gpA spray rate. - Aug 7,96
25.35	-Fertilize w/ JD750 drill at 80# N in form of 32-0-0 liquid Nitrogen fertilizer on October 7,96
27.14	-Plant to Nekota (90#/A rate)w/JD750 drill at 10" rows + 6 gal/A liquid 10-34-0. Seed treated w/5 oz/100 lbs Vitavax Thiram RTU. – October 8,96
8.98	-Spray w/.1 oz Ally + 8 oz LV4 + 18 ml Penetrate + 3 oz Banvel 4L/A at 8 gpa spray rate. - May 9,97
13.36	-Harvest 26.8 bu / acre winter wheat – on August 7,97 Test weight – 58.6# / bushel
.40	-Soil Sampling
25.00	-Land Charges 1997
110.50	Total Cost of Winter Wheat Production

Rotation 6a

WINTER WHEAT / *SAFFLOWER* / CHICKPEAS / SPRING WHEAT

Cost / A.	1997 Safflowers
13.00	-Apply 1# ai TR-10 granules and under-cut w/24" sweeps. - Oct.23,96
20.25	-Spray on 32-0-0 liquid Nitrogen fertilizer (60#N/Acre).-March 26,97
4.25	-Worked w/12" sweeps to final incorporate TR:10 granules seal in nitrogen and loosen soil. March 26,97.
9.07	-Spray w/16 oz Roundup Ultra + liquid ammonium sulfate at 50 ml/gallon 8 gallons per acre spray rate. On April 25,97
4.25	-Disk to final incorporate TR:10 granules. - April 25,97.
29.72	-Plant to CalWest–88OL (high oleic) sunflowers w/JD 610 drill, 3-20" rows + 6 gallons per acre 10-34-0. Seeded at 30 pounds per acre. 80% germ.
21.50	-Reseeded to CalWest 88-OL at 30 pounds per acre due to crusting on May 5,97. No starter fertilizer used.
12.68	-Harvest 936# / Acre Safflowers - Sept. 3,96 Test weight – 32.9# per bushel
.40	-Soil Sampling
25.00	-Land Charges 1997
140.12	Total Cost of Safflower Production

Rotation 6a

WINTER WHEAT / SAFFLOWER / *CHICKPEAS* / SPRING WHEAT

Cost / A.	1997 Chick Peas
13.00	-Apply 1# ai TR-10 granules and under-cut w/24" sweeps. - Oct.23,96
4.25	-Worked w/12" sweeps and harrow to final incorporate TR:10 granules on March 31,97.
81.84	-Plant to Sanford Chickpeas at 150# per acre + starter fertilizer at 6 gallons per acre. Seed was inoculated. On April 2,97
20.20	-Spray with 1¼ pints Poast + 20 oz crop oil / acre at 8 gallons per acre spray rate on May19 ,97.
11.18	-Sprayed with Roundup Ultra at 24 oz per acre as a pre-harvest burn down to kill kochia and terminate chick pea growth. On August 19,97.
12.00	-Harvest 529# / Acre Sanford chick peas - Sept. 2,97 Test weight – 58.9# per bushel
.40	-Soil Sampling
25.00	-Land Charges 1997
167.87	Total Cost of Chickpea Production

Rotation 6a

WINTER WHEAT / SAFFLOWER / CHICKPEAS / *SPRING WHEAT*

Cost / A.	1997 Spring Wheat
10.27	-Spray w/ 12 oz/A Roundup Ultra + 50 ml/gal liquid ammonium sulfate + Banvel at 4 oz/A 8 gpA spray rate. - Aug 7,96
25.85	-Spray on liquid nitrogen in the form of 32-0-0 at 80# N / acre. - March 26,97
4.25	- Worked plots w/ 12" sweeps to seal in nitrogen and loosen soil. - March 26,97.
27.89	-Plant to Oxen (90#/A rate)w/JD750 drill at 10" rows + 6 gal/A liquid 10-34-0. Seed treated w/5 oz/100 lbs Vitavax Thiram RTU. – March 26,97
9.07	-Spray w/16 oz Roundup Ultra + 50 ml/gal liquid ammonium sulfate to kill cheatgrass.on March 31,97
11.94	-Spray w/ 1 pint Dakota + 2 oz Banvel 4L at 10 gallons per acre rate on May 15,97.
17.56	-Harvest 47.8 bu / acre spring wheat – on August 7,97 Test weight – 54.9# / bushel
.40	-Soil Sampling
25.00	-Land Charges 1997
132.23	Total Cost of Spring Wheat Production

Rotation 6a SUMMARY 1997

Crop	Income	Expenses	Net Income Per Acre
Winter Wheat	87.10	110.50	- 23.40
Safflower	37.44	140.12	- 102.68
Chickpeas	26.45	167.87	- 141.42
Spring Wheat	167.30	132.23	35.07
	$318.29	$550.72	$ - 232.43 / 4 = $ - 58.11

$ - 58.11 Average Income / acre for Rotation 6a - 1997

Rotation # 6a: Winter Wheat / Safflower / Millet (1997 chick peas) / Winter Wheat

This is a rotation that would be less moisture intensive than rotation 5a but will still allow for the two years out of wheat. The rotation also contains two winter wheat crops, which means ½ the acres are planted to wheat each season. The rotation lost money in 1997 due to the loss of the safflower crop to leaf spotting diseases and the one year loss on the chick peas. The early years of this rotation indicated problems with cheatgrass (downy-brome) during the winter wheat crop season. This rotation only had chick peas in the rotation because we needed to get the crops in proper sequence and the plots area was treated with Treflan herbicide. The economic return from chick peas was very poor due to high input cost and the crop lacking quality to be sold as human edible food.

Rotation 7

WINTER WHEAT / CORN / FALLOW

Cost / A.	1997 Winter Wheat
25.57	-Plant to Nekota(75#/A rate)w/JD610 drill at 12" rows + 6 gal/A liquid 10-34-0. Seed treated w/5 oz/100 lbs Vitavax, Thiram, RTU on Sept.28,96
9.07	-Sprayed w/16 oz Roundup Ultra + 50 ml/gal liquid Ammonium Sulfate. 8 gallon/Acre spray rate. On March 31,97
17.00	-Planted to Butte 86 on March 31,97w/ JD 610 drill @ 90l#/Acre. No seed treatment or fertilizer added.
25.85	-Spray on liquid nitrogen in the form of 32-0-0 at 80# N / acre. – April 24,97
11.94	-Spray w/1 pint Dakota + 2 oz Banvel 4L 10 gallon / acre spra;y rate. - May 15,97
16.26	-Harvest 41.3 bu / acre spring wheat – August 7,97 Test weight – 60.4# / bushel
.40	-Soil Sampling
25.00	-Land Charges 1997
131.09	Total Cost of Winter Wheat Production

Rotation 7

WINTER WHEAT / *CORN* / FALLOW

Cost / A.	1997 Corn
12.70	-Spray wheat stubble w/ 2 1/2# ai Aatrex (90df) plus 1 qt crop oil 10 gpA rate. – Oct. 22,96.
24.33	-Spray on 28-0-0 liquid Nitrogen fertilizer (80#N/Acre).-April 24,97
39.72	-Plant to Dekalb DK-417 (P26) . 91 day maturity. w/ JD 750 finger planter, 30" row spacing, seed spacing of 10.5" to achieve 20,000 plant population/acre. 10-34-0 starter fertilizer was added at 6 gallons per acre. April 28,97.
31.50	-Replanted to DK-417 due to crusting and poor stands. – May 16,97
21.32	-Spray corn w/ Accent at .66 oz/acre plus 6.4 oz/acre crop oil at 10 gallons of water/acre to control grassy weeds on June 16,97
24.52	-Harvest 82.6 bushels / acre corn on October 6,97 Test weight – 57.0# / bushel
.40	-Soil Sampling
25.00	-Land Charges 1997
179.49	Total Cost of Corn Production

Rotation 7

WINTER WHEAT / CORN / *FALLOW*

Cost / A.	1997 Summer Fallow
10.27	-Spray w/12 oz/A Roundup Ultra + 50 ml/gal Ammonium Sulfate + 4 oz Banvel/A 8 gpa rate. - Aug. 7, 96 (prior to seeding)
4.25	-worked fallow ground w/ chisel points & rodweeder -Sept. 10, 96
12.77	-Spray w/16 oz Roundup Ultra + 6 oz Banvel 4L + Ammonium sulfate at 50 ml/gallon + penetrate @ 18 ml/gallon. 8 gallon per acre spray rate.
4.25	-Work plots w/12" sweeps & no rod weeder. – June 18,97
4.25	-Work plots w/12" sweeps with rod weeder. – July 15,97
25.00	-Land Charges 1997
60.79	Total Cost of Summer Fallow

Rotation 7 SUMMARY 1997

Crop	Income	Expenses	Net Income Per Acre
Winter Wheat as HRS	144.55	131.09	13.46
Corn	181.72	179.49	2.23
Fallow	0.00	60.79	-60.79
	$326.27	$371.37	$ - 45.10 / 3 = - 15.03

$ -15.03 Average Income / acre for Rotation 7 - 1997

Rotation #7: Winter Wheat / Corn / Fallow

The corn in this rotation had an excellent yield of 82 bushels per acre even though it had to be replanted. The inputs to produce this 80 bushels of corn was quite high because it had to be replanted and the herbicide treatments included a 21 dollars per acre post emergence spraying. The winter wheat had to be replanted to spring wheat because of winterkill. This increased the cost of producing the crop. This rotation could be made more profitable by reducing inputs in the future.

Rotation #8

The plots from this rotation were added to Rotations 5, 6 and 9 to make longer 4 year rotations.

Rotation 9a

WINTER WHEAT -A / SAFFLOWER / LEGUME FALLOW / WINTER WHEAT-B

Cost / A.	1997 Winter Wheat -A
10.27	-Spray w/ 12 oz/A Roundup Ultra + 50 ml/gal liquid ammonium sulfate + Banvel at 4 oz/A 8 gpA spray rate. - Aug 7,96
4.25	-Work plots w/chisel points and rod weeder.
25.57	-Plant to Nekota(75#/A rate) w/JD610 drill at 10" rows + 6 gal/A liquid 10-34-0. Seed treated w/5 oz/100 lbs Vitavax Thiram RTU. – September 28,96
9.07	-Sprayed w/16 oz Roundup Ultra + 50 ml/gal liquid Ammonium Sulfate. 8 gallon/Acre spray rate. On March 31,97
17.00	-Planted to Butte 86 on March 31,97w/ JD 610 drill @ 90#/Acre. No seed treatment or fertilizer added.
11.94	-Spray w/1 pint Dakota + 2 oz Banvel 4L 10 gallon / acre spra;y rate. - May 15,97
14.02	-Harvest 30.1 bu / acre spring wheat – August 7,97 Test weight – 61.2# / bushel
.40	-Soil Sampling
25.00	-Land Charges 1997
117.52	Total Cost of Wheat Production

Rotation 9a

WINTER WHEAT-A / *SAFFLOWER* / LEGUME FALLOW / WINTER WHEAT-B

Cost / A.	1997 Safflowers
13.00	-Apply 1# ai TR-10 granules and under-cut w/24" sweeps. - Oct.23,96
20.25	-Spray on 32-0-0 liquid Nitrogen fertilizer (60#N/Acre).-March 26,97
4.25	-Worked w/12" sweeps to incorporate TR:10 granules seal in nitrogen and loosen soil. – March 26,97.
9.07	-Spray w/16 oz Roundup Ultra + liquid ammonium sulfate at 50 ml/gallon 8 gallons per acre spray rate. On April 25,97
4.25	-Disk to final incorporate TR:10 granules. - April 25,97.
29.72	-Plant to CalWest–88OL (high oleic) sunflowers w/JD 610 drill, 3-20" rows + 6 gallons per acre 10-34-0. Seeded at 30 pounds per acre. 80% germ. On April 25,97
21.50	-Reseeded to CalWest 88-OL at 30 pounds per acre due to crusting on May 5,97. No starter fertilizer used.
13.84	-Harvest 1167# / Acre Safflowers - Sept. 3,96 Test weight – 33.9# per bushel
.40	-Soil Sampling
25.00	-Land Charges 1997
141.28	Total Cost of Safflower Production

Rotation 9a

WINTER WHEAT-A / SAFFLOWER / *LEGUME FALLOW* / WINTER WHEAT-B

Cost / A.	1997 Alfalfa Fallow
12.77	-Spray w/16 oz/A Roundup RT + additives + 6 oz Banvel 4L per acre 8 gpa rate. – May 19,97
4.25	-Worked ground w/ 12" sweeps – June 18,97
8.50	-Broadcast alfalfa seed on at 6# / acre on safflower crop - July 8, 97.
4.25	-Work plots with 12" sweeps with rod weeder. – July 15,97.
25.00	-Land Charges 1997
54.77	Total Cost of Legume Summer Fallow

Rotation 9a

WINTER WHEAT-A / SAFFLOWER / LEGUME FALLOW / *WINTER WHEAT-B*

Cost / A.	1997 Winter Wheat-B
10.27	-Spray w/ 12 oz/A Roundup Ultra + 50 ml/gal liquid ammonium sulfate + Banvel at 4 oz/A 8 gpA spray rate. - Aug 7,96
4.25	-Work plots w/chisel points and rod weeder.
25.57	-Plant to Nekota(75#/A rate) w/JD610 drill at 10" rows + 6 gal/A liquid 10-34-0. Seed treated w/5 oz/100 lbs Vitavax Thiram RTU. – September 28,96
9.07	-Sprayed w/16 oz Roundup Ultra + 50 ml/gal liquid Ammonium Sulfate. 8 gallon/Acre spray rate. On March 31,97
17.00	-Planted to Butte 86 on March 31,97w/ JD 610 drill @ 90#/Acre. No seed treatment or fertilizer added.
25.85	-Spray on 80#N per acre as 32-0-0.
11.94	-Spray w/1 pint Dakota + 2 oz Banvel 4L 10 gallon / acre spra;y rate. - May 15,97
16.54	-Harvest 42.7 bu / acre spring wheat – August 7,97 Test weight – 60.5# / bushel
.40	-Soil Sampling
25.00	-Land Charges 1997
145.89	Total Cost of Wheat Production

Rotation 9a SUMMARY 1997

Crop	Income	Expenses	Net Income Per Acre
Winter Wheat-A as HRS	105.35	117.52	- 12.17
Safflower	46.68	141.28	- 94.60
Legume Fallow	0.00	54.77	- 54.77
Winter Wheat-B as HRS	149.45	145.89	3.56
	$301.48	$459.46	$ - 157.98 / 4 = $ - 39.50

$ - 39.50 Average Income / acre for Rotation 9a - 1997

Rotation #9a: Winter Wheat-A / Safflower / Legume Fallow /Winter Wheat-B

This rotation is a less moisture intensive sequence with a fallow period after the safflower crop to build up soil moisture and increase nitrogen in the soil. The winter wheat crop planted on fallow was lost to winterkill during the winter of 1997 and had to be replanted to spring wheat. The safflower crop was lost to leaf spotting diseases during the late summer after summer rains and high humidity allows the disease to spread. The 1997 crop season resulted in a big loss for this rotation. This rotation should be more profitable in the future by reducing the amount of nitrogen fertilizer required for crop production.

Rotation 10

WINTER WHEAT / FIELD PEAS / MILLET

Cost / A.	1997 Winter Wheat
10.27	-Spray w/ 12 oz/A Roundup Ultra + 50 ml/gal liquid ammonium sulfate + Banvel at 4 oz/A 8 gpA spray rate. - Aug 7,96
25.35	-Fertilize w/ JD750 drill at 80# N in form of 32-0-0 liquid Nitrogen fertilizer on October 7,96
27.14	-Plant to Nekota(90#/A rate)w/JD750 drill at 10" rows + 6 gal/A liquid 10-34-0. Seed treated w/5 oz/100 lbs Vitavax Thiram RTU. – October 8,96
12.24	-Spray w/.4 oz Harmony Extra + 8 oz LV4 + 18 ml Penetrate + 3 oz Banvel 4L/A at 8 gpa spray rate. - May 9,97
15.08	-Harvest 35.4 bu / acre winter wheat – on August 7,97 Test weight – 58.4# / bushel
.40	-Soil Sampling
25.00	-Land Charges 1997
115.48	Total Cost of Wheat Production

Rotation 10

WINTER WHEAT / *FIELD PEAS* / MILLET

Cost / A.	1997 Field Peas
10.27	-Spray w/ 12 oz/A Roundup Ultra + 50 ml/gal liquid ammonium sulfate + Banvel at 4 oz/A 8 gpA spray rate. - Aug 7,96
9.07	-Spray with 16 oz Roundup Ultra + liquid ammonium sulfate at 50 ml/gallon. On March 31,97.
29.55	-Plant to Arvika field peas at 100# per acre w/JD 610 drill + 10-34-0 at 6 gallons per acre. Seed was inoculated with pea & lentil inoculum. On April 2,97
12.35	-Harvest 1306# / Acre Arvika peas – August 8,97 Test weight – 60.2# per bushel
.40	-Soil Sampling
25.00	-Land Charges 1997
86.64	Total Cost of Field Pea Production

Rotation 10

WINTER WHEAT / FIELD PEAS / *MILLET*

Cost / A.	1997 Millet
10.22	-Spray w/12 oz Roundup Ultra + 50 ml/gallon Ammonium Sulfate + Aatrex 90df @ ¾# ai/A. 8 gallon per acre spray rate. – October 22,96
19.10	-Spray 28-0-0 liquid Nitrogen fertilizer added 60#N/Acre.-April 24,97
10.31	-Spray w/16 oz Roundup Ultra + 75 grams/gallon ammonium sulfate crystals+ 2 oz Banvel 4L / acre. Sprayed at 8 gallons per acre spray rate. On June 2,97.
19.22	-Planted to Sunup millet w/JD750 drill. w/ starter fertilizer(10-34-0) at 6 gal/Acre. Row spacing was at 10". Seeding rate was at 20#/A. - June 7,97
22.57	-Harvest 3642# / acre Millet – September 2,97
.40	-Soil Sampling
25.00	-Land Charges 1997
106.82	Total Cost of Millet Production

Rotation 10 SUMMARY 1997

Crop	Income	Expenses	Net Income Per Acre
Winter Wheat	115.05	115.48	- .43
Field Peas	87.07	86.64	.43
Millet	163.89	106.82	57.07
	$366.01	$308.94	$ 57.07 / 3 = 19.02

$ 19.02 Average Income / acre for Rotation 10 - 1997

Rotation #10: Winter Wheat / Field Peas / Millet

The millet crop was the best money making crop of this rotation with a return of 57 dollars per acre. The millet price was low but the millet yields were extremely high at about 3600 pounds per acre. This yield was 900 pounds per acre higher than other millet plots in the rotations. The reason for the higher millet yields must be rotational and we will have a better understanding of this next year. The field peas were forage type because they are less expensive to grow and therefore were priced as feed stock and not as human edible peas. The yields of the peas in the Wall, SD area has been about 22-25 bushels per acre as you go north in the state the yields have been higher and in ND yields have been as high as 40 bushels per acre.

Rotation 11

WINTER WHEAT / CORN / MILLET

Cost / A.	1997 Winter Wheat
10.27	-Spray w/ 12 oz/A Roundup Ultra + 50 ml/gal liquid ammonium sulfate + Banvel at 4 oz/A 8 gpA spray rate. - Aug 7,96
25.35	-Fertilize w/ JD750 drill at 80# N in form of 32-0-0 liquid Nitrogen fertilizer on October 7,96
27.14	-Plant to Nekota(90#/A rate)w/JD750 drill at 10" rows + 6 gal/A liquid 10-34-0. Seed treated w/5 oz/100 lbs Vitavax Thiram RTU. – October 8,96
12.24	-Spray w/.4 oz Harmony Extra + 8 oz LV4 + 18 ml Penetrate + 3 oz Banvel 4L/A at 8 gpa spray rate. - May 9,97
13.52	-Harvest 27.6 bu / acre winter wheat – on August 7,97 Test weight – 57.4# / bushel
.40	-Soil Sampling
25.00	-Land Charges 1997
113.92	Total Cost of Winter Wheat Production

Rotation 11
WINTER WHEAT / *CORN* / MILLET

Cost / A.	1997 Corn
12.70	-Spray wheat stubble w/ 2 1/2# ai Aatrex (90df) plus 1 qt crop oil 10 gpA rate. – Oct. 22,96.
24.33	-Spray on 28-0-0 liquid Nitrogen fertilizer (80#N/Acre).-April 24,97
39.72	-Plant to Dekalb DK-417 (P26) . 91 day maturity. w/ JD 750 finger planter, 30" row spacing, seed spacing of 10.5" to achieve 20,000 plant population/acre. 10-34-0 starter fertilizer was added at 6 gallons per acre. April 28,97.
31.50	-Replanted to DK-417 due to crusting and poor stands. – May 16,97
21.32	-Spray corn w/ Accent at .66 oz/acre plus 6.4 oz/acre crop oil at 10 gallons of water/acre to control grassy weeds on June 16,97
25.04	-Harvest 85.2 bushels / acre of corn on October 6,97 Test weight – 56.8# / bushel
.40	-Soil Sampling
25.00	-Land Charges 1997
180.01	Total Cost of Corn Production

Rotation 11
WINTER WHEAT / CORN / *MILLET*

Cost / A.	1997 Millet
19.10	-Spray 28-0-0 liquid Nitrogen fertilizer added 60#N/Acre.-April 24,97
12.77	-Spray w/ 16 oz RT + 6 oz Banvel 4L + liquid ammonium sulfate at 50 ml/gal + 18 ml Penetrate. – May 17,97
10.31	-Spray w/16 oz Roundup Ultra + 75 grams/gallon ammonium sulfate crystals+ 2 oz Banvel 4L / acre. Sprayed at 8 gallons per acre spray rate. On June 2,97.
19.22	-Planted to Sunup millet w/JD750 drill. w/ starter fertilizer(10-34-0) at 6 gal/Acre. Row spacing was at 10". Seeding rate was at 20#/A. - June 7,97
17.24	-Harvest 2309# /acre Millet – September 2,97
.40	-Soil Sampling
25.00	-Land Charges 1997
104.04	Total Cost of Millet Production

Rotation 11 SUMMARY 1997

Crop	Income	Expenses	Net Income Per Acre
Winter Wheat	89.70	113.92	- 24.22
Corn	187.44	180.01	7.43
Millet	103.91	104.04	- .13
	$381.05	$397.97	$ 16.92 / 3 = - 5.64

$ - 5.64 Average Income / acre for Rotation 11 - 1997

Rotation #11: Winter Wheat / Corn / Millet

The yields of winter wheat were down and the price per bushel was also down this season. The corn had an excellent yield at 85 bushels per in 1997 but the input cost were high because we needed to replant the plots due to poor stand. The millet plots had a good yield but millet prices were down this season and the crop did not net very much income. This rotation has a lot of potential for the livestock producer that could use the forage produced as well as the cash grain crop. This is one of the most profitable rotations in north eastern Colorado studies.

Wall Rotation Rain-Fall Data (1997)

Total Precip.(inches)		Total Precip.(inches)	
April	3.00	August	2.48
May	3.39	September	1.30
June	1.62	October	1.30
July	8.85	November	.80

(Accumulative total precipitation from Apr.1 to Nov.30 is 22.74")

Cost of Inputs - 1997

SEED

Nekota Winter Wheat	$6.50/Bu
Oxen Spring Wheat	7.00/Bu
Butte 86	6.00/Bu
Sunup Millet	.15 / lb
Sanford chick peas	.43 / lb
Arvika Field Peas	8.00/Bu(60 lbs)
DK 417 Corn	94.00/Bu(80,000 kernels)
Yukon	105.00 per 300,000 seeds
Cal West 88-OL Safflowers	22.50 / 50 lb
Alfalfa	1.00 / lb

LIQUID FERTILIZERS

10-34-0	$235/Ton ($1.37/gal)
28-0-0	145/Ton ($.78/gal)
32-0-0	179/Ton ($1.00/gal)

HERBICIDES

(From Warne Chemical-Fall of 1996)

Roundup Ultra	$40.41/gal
Penetrate II	17.90/gal
Ammonium Sulfate	4.22/gal
Atrazine 90df	2.91/lb
Crop Oil	4.50/gal
Buctril	56.75/gal
Accent	26.40/oz
Ally	21.13/oz
Treflan 10% granules	.90/lb
LV6 (2,4D Ester)	19.58/gal
LV4(2,4D Ester)	13.05/gal
Banvel	78.93/gal
Bronate	47.85/gal
Poast	102.60/gal
Fallow Master	16.00/gal
Dakota	58.07/gal
Landmaster BW	18.62/gal
Harmony Extra	13.39/oz
Lasso Micro-tech	24.55/gal
Cyclone	38.17/gal

INSECTICIDES

Lorsban 4E	51.25/gal

NO-TILL PLANTING CHARGES

$8.00/Acre

LAND CHARGES

$25.00/Acre

SPRAY APPLICATION FEE

$3.50/Acre

HARVEST CHARGES

Base is $12 per acre @ 20 bushels.
$.20/Bu for yields above 20 bushels

GRAIN SALE VALUES

(Hi + Low/2 from 7-15 to 11-1,97 Dakota Mill & Grain,Rapid City)

Winter Wheat-11.6% pro	$3.25/bu
Spring Wheat-12% pro	3.50/bu
Corn #2 yellow	2.20/bu
Proso Millet	4.50/cwt
Field Peas (feed)	4.00/bu
Sunflowers (oil-type)	9.50/cwt
Safflowers (oil-type)	4.00/cwt
Chickpeas(as feed)	.05/lb
(as human edible)	.18/lb

SOIL SAMPLING & ANALYSIS

$.40 per acre

SEED TREATMENTS

Vitavax/Thiram/RTU	$33.41/gal (5 oz/100# seed)
Seed treatment fee	$ .25/Acre
Field Pea innoculum.(peat base)	$ .45/bu

MECHANICAL TILLAGE CHARGE

$4.25 / Acre

Wall Rotation Study Soil Analysis - As of November 21, 1997 for the 1998 Season

	98 Crop	Soil Texture	Soil pH	Soluble Salts	Organic Matter %	NO3-N # / acre 0-6" top	NO3-N # / acre 0-24" total	SO4-S # / acre 0-6" top	SO4-S # / acre 0-24" total	P ppm	K ppm	Add N #/A	Add P205 #/A	97 Yield Bushels/A
101-1	HRW-60bu	Medium	6.4	0.5	1.6	29	66	4	16	9	428	85	30	Fallow
102-1	Fallow	Medium	6.8	0.6	1.6	12	44	6	12	7	399	0	0	32.9 bu HRS (Butte 86)
103-2	Sunf-1500#	Medium	6.8	0.6	1.5	6	15	4	16	6	418	60	20	36.1 bu HRW
104-2	Mil-2000#	Medium	6.6	0.5	1.8	6	16	12	42	8	456	55	15	1885# Sunflowers
105-2	HRW-45bu	Medium	6.7	0.6	1.9	3	12	6	48	13	390	100	10	2796# Millet
106-3	Saff-1500#	Medium	7.0	0.6	1.9	8	18	6	18	6	404	55	25	33.5 bu HRW
107-3	Mil-2000#	Medium	6.6	0.5	1.7	9	19	6	18	5	362	50	25	1010# Safflower
108-3	HRW-45bu	Medium	6.7	0.5	1.8	4	14	8	56	8	456	100	25	2752# Millet
109-4	HRW-45bu	Medium	6.7	0.5	2.0	3	12	8	32	10	439	100	20	2781# Millet
110-4	Mil-2000#	Medium	6.8	0.5	1.9	9	25	4	10	11	472	45	10	24.4 bu HRW
111-5a	Corn-80 bu	Medium	6.8	0.6	1.8	7	18	6	24	13	464	80	10	31.7 bu HRW
122-5a	Sunf-1500#	Medium	6.9	0.6	1.7	2	11	12	72	11	419	65	10	86.8 bu Corn
112-5a	HRS-40bu	Medium	7.0	0.6	1.5	4	12	14	44	6	397	90	25	1822# Sunflower
113-5a	HRW-45bu	Medium	7.0	0.6	1.5	8	25	6	18	9	447	90	20	41.7 bu HRS (Oxen)
114-6a	Saff-1500#	Medium	6.9	0.6	1.6	8	23	6	24	8	402	50	20	26.8 bu HRW
115-6a	Mil-2000#	Medium	6.6	0.5	1.6	14	26	6	18	8	400	45	15	936# Safflower
121-6a	HRS-40bu	Medium	6.7	0.5	1.7	2	11	8	44	9	472	90	20	529# Chickpeas
116-6a	HRW-45bu	Medium	6.5	0.5	1.9	4	21	4	22	11	488	90	15	47.8 bu HRS (Oxen)
117-7	Corn-80 bu	Medium	6.7	0.5	1.9	11	30	6	18	10	454	65	20	41.3 bu HRS (Butte 86)
118-7	Fallow	Medium	6.9	0.6	1.9	6	13	10	46	11	433	0	0	82.6 bu Corn
119-7	HRW-60bu	Medium	6.6	0.6	1.8	26	61	6	24	9	443	90	25	Fallow
123-9a	Saff-1500#	Medium	6.8	0.6	1.6	7	19	6	30	9	420	55	15	30.1 bu HRS (Butte 86)
124-9a	Fallow	Medium	6.6	0.5	1.5	7	20	4	10	9	397	0	0	1167# Safflower
125-9a	HRW-60bu	Medium	6.8	0.6	1.5	27	73	8	26	13	488	75	10	Clover Fallow
120-9a	HRW-45bu	Medium	6.5	0.5	1.7	3	15	0	12	8	448	95	25	42.7 bu HRS (Butte 86)
126-10	Peas-1500#	Medium	6.9	0.6	1.8	7	19	6	12	8	458	55	15	35.4 bu HRW
127-10	Mil-2000#	Medium	6.9	0.6	1.8	10	23	4	16	9	455	45	15	1306# Peas
128-10	HRW-45bu	Medium	6.4	0.5	1.9	2	11	10	40	13	460	100	10	3642# Millet
129-11	Corn-80bu	Medium	6.5	0.5	1.8	6	15	6	12	10	449	80	20	27.6 bu HRW
130-11	Mil-2000#	Medium	7.0	0.6	1.8	5	15	8	44	7	415	55	20	85.2 bu Corn
131-11	HRW-45bu	Medium	6.8	0.6	1.9	3	13	10	46	13	438	100	10	2309# Millet

Note: to convert P & K values to #/A take ppm value x 2.

Example: 500 ppm is equal to 1000#/Acre

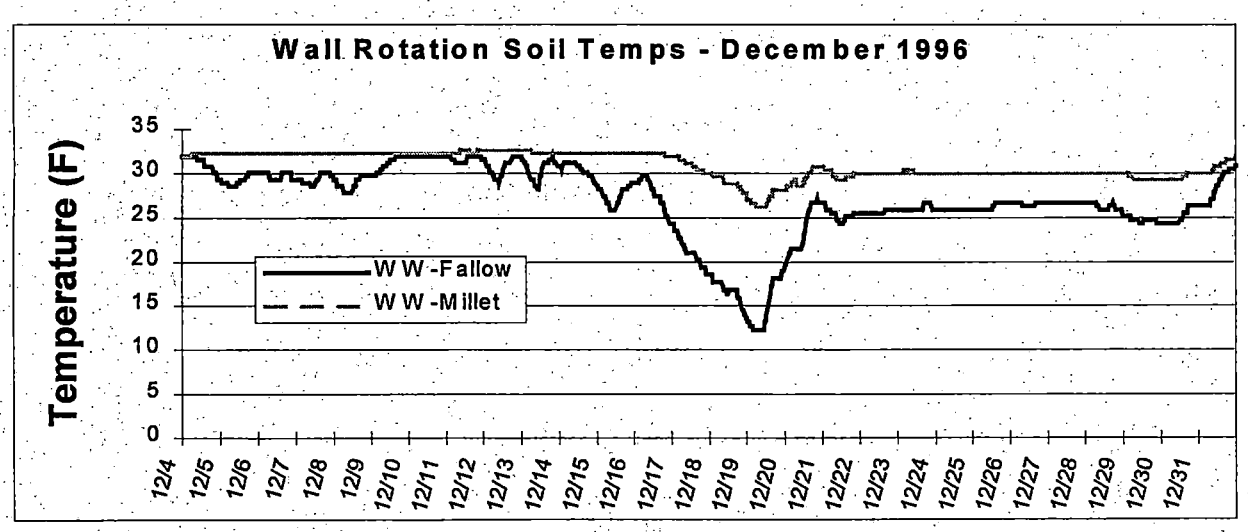
Soil Temperature Effects on the Survival of Winter Wheat

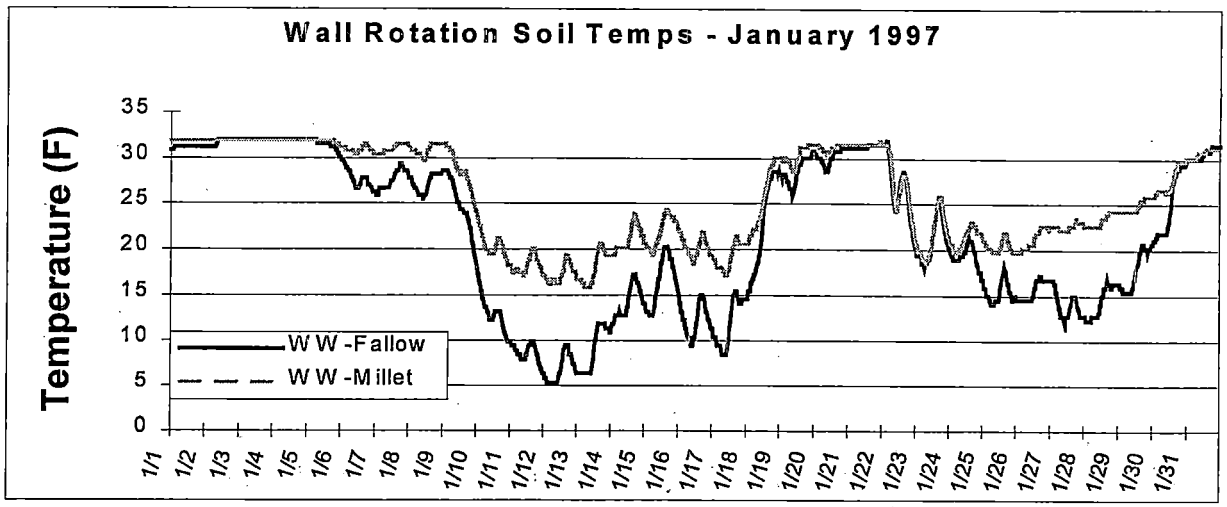
The soil temperature probes have provided some interesting data that helps explain the survival of the winter wheat crop. The data form the plots compares soil temperatures taken each hour during the winter of 1996 for winter wheat planted on fallowed land and winter wheat no-till planted into millet stubble. The temperature readings from December through March are shown in the following four charts. The temperatures for December of 1996 show an almost flat line of 32 degrees for the plots no-tilled into millet stubble. The soil temperatures for the plots planted on summer fallow had a much greater variation in soil temperatures, this was due to snow cover that provided excellent insulation during the early winter. The plots planted on fallow allow much greater change in temperatures with lower temperatures during December and January. Soil temperatures below 10 degrees would be a problem for most commonly grown varieties of winter wheat. The soil temperatures on the fallow planted winter wheat did dip to a low of about 5 degrees in January 1997 and the Arapahoe winter wheat was dead in the spring and had to be replanted to spring wheat.

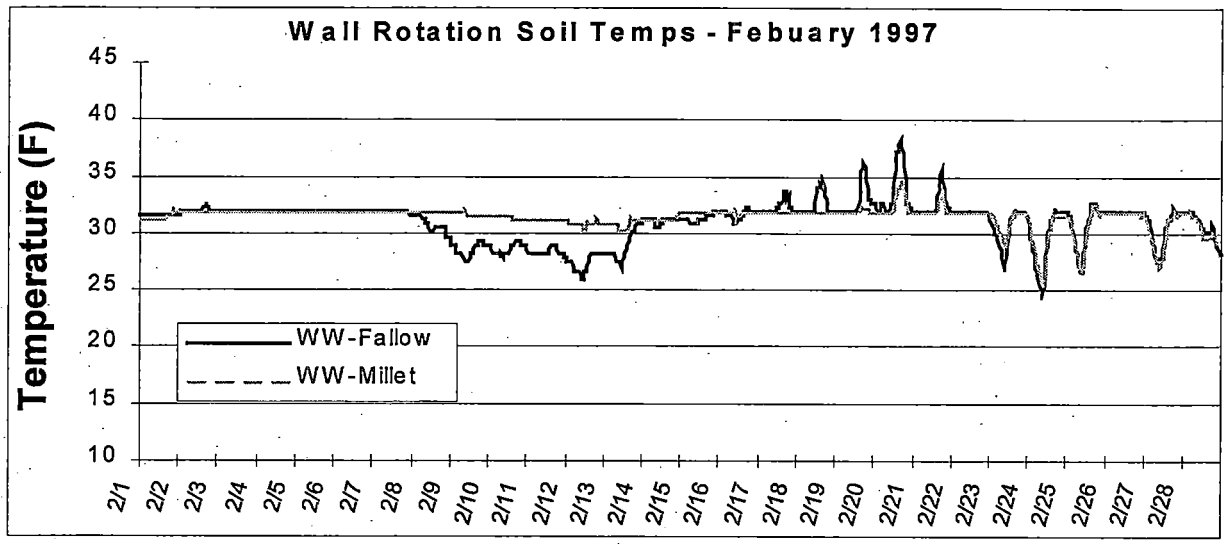
The soil temperatures during February and early March also indicated the fallow planted wheat had higher and lower soil temperatures for short periods of time. Later in March the stubble planted wheat had warmer soil temperatures. The warmer soil temperature in Late March and early April are consistent with data from hand held soil temperature readings observed in the past.

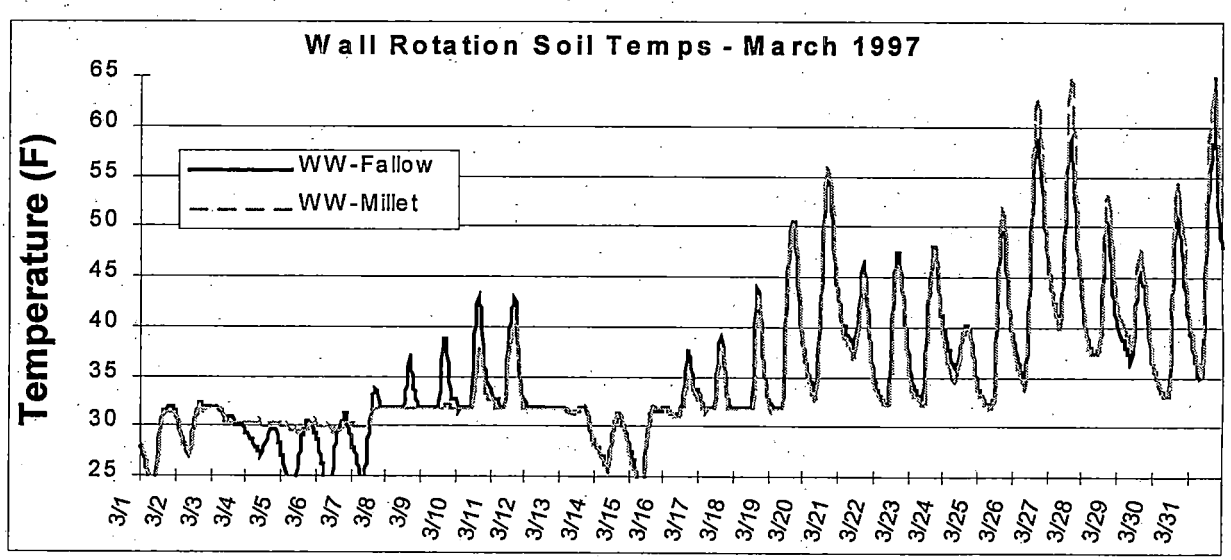
This information may allow producers to get an early predication of how the soil temperatures effected the winter wheat in the future. This data would also be useful in making better variety selections when planting no-till into protective cover. The varieties that do well on fallow generally are doing well in no-till plantings. However this information may allow the producer to select a less winter hardy variety to grow because of other traits such as disease resistance or maturity.

The information form 1996 and 1997 was interesting and based on this data the South Dakota Wheat Commission purchased 45 of the automatic soil temperature probes to be installed at crop performance testing locations state wide and at the crop rotation study locations in western South Dakota. The soil temperature probes are installed and we are collecting data for this next growing season.




Wall Rotation Soil Temps - January 1997
Temperature (F)
35
30
25
20
15
10
5
0
WW-Fallow
WW-Millet
1/1 1/2 1/3 1/4 1/5 1/6 1/7 1/8 1/9 1/10 1/11 1/12 1/13 1/14 1/15 1/16 1/17 1/18 1/19 1/20 1/21 1/22 1/23 1/24 1/25 1/26 1/27 1/28 1/29 1/30 1/31


Wall Rotation Soil Temps - Febuary 1997
Temperature (F)
45
40
35
30
25
20
15
10
WW-Fallow
WW-Millet
2/1 2/2 2/3 2/4 2/5 2/6 2/7 2/8 2/9 2/10 2/11 2/12 2/13 2/14 2/15 2/16 2/17 2/18 2/19 2/20 2/21 2/22 2/23 2/24 2/25 2/26 2/27 2/28


Wall Rotation Soil Temps - March 1997
Temperature (F)
65
60
55
50
45
40
35
30
25
WW-Fallow
WW-Millet
3/1 3/2 3/3 3/4 3/5 3/6 3/7 3/8 3/9 3/10 3/11 3/12 3/13 3/14 3/15 3/16 3/17 3/18 3/19 3/20 3/21 3/22 3/23 3/24 3/25 3/26 3/27 3/28 3/29 3/30 3/31

No-Till Winter Wheat Date of Planting Study, 1997

Cooperators: Gregg Krebsbach (New Underwood, SD) ; Don Brown (Scenic)

Objectives: To compare yields of various varieties of winter wheat when planted into millet or No-Till fallow wheat stubble. To compare yield and quality responses of these when planted at 4 different planting dates.

Procedure: Seven varieties of winter wheat and one spring wheat (Oxen) were planted on 4 seeding dates,(Sept,15,Oct 1,Oct 15, and Nov 1) at 2 locations. Nekota was planted at 60, 75, 90, & 120 lbs/acre at all 4 seeding dates. On the other varieties, the 1st date had a seeding rate of 60#/acre. The 2nd date was seeded at 75#/acre. The 3rd date was seeded at 90#/acre, The 4th date was seeded at 120#/acre. The trials were seeded with a John Deere 750 no-till drill with liquid starter fertilizer (10-34-0) at 6 gallons/Acre. Row spacing was at 10 inches. The Scenic location was harvested on August 12,1997. The planting date study at New Underwood was harvested on August 14,1997.

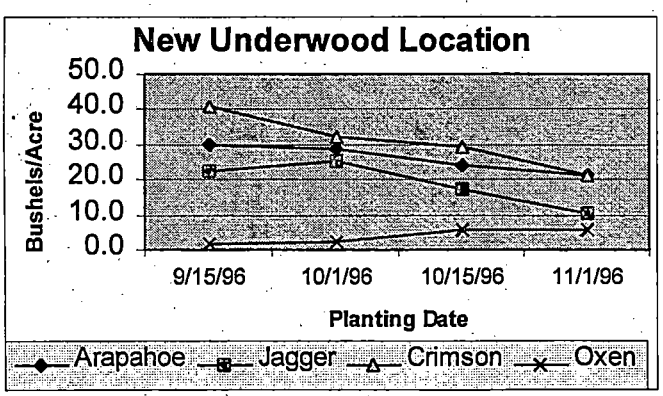
Discussion: This is a very interesting study because we are testing varieties and planting dates for no-till planted winter wheat. The soil temperatures for winter wheat planted into stubble are much more consistent and favorable for the survival of winter wheat. This type of testing may lead the recommendation of different varieties for stubble planting and fallow planting. This technology may also allow us to move the winter wheat production farther north in the state. The yields of winter wheat are currently slightly less for wheat planted back into stubble when compared to summer fallow planted winter wheat. However when you consider the opportunity to raise more crops and less summer fallow the over all return from the rotation may be greater. Results of each date at both locations are shown in Tables 25-28.

The fall of 1996 was cool and there was little growth of the wheat prior to November when the soil reached low temperatures and stopped the growth of the winter wheat. The September 15 planting date had 4 to 5 leaves with 2 tillers, the October 1 planting date had 3 leaves and no tillers while the October 15 planting date the seed had just swollen on November 7,1997. The winter was long with snow cover and ice at times during the winter. Winter wheat planted on summer fallow in the area was lost to winterkill. The first two planting dates had good survival on the winter wheat and almost total loss of the spring wheat. The spring wheat oxen had a very thin stand but the few kernels that did lay dormant and germinated in the spring had an unlimited area to grow in with better yield from the last 2 planting dates. It would appear from this one-year's data that the winter wheat had more cold resistance and would be better when considering a dormant seeding.

The new winter wheat variety Crimson had an excellent yield record this season, which could be due to the fact that it has more dormancy in the spring than most of the other varieties. The summer also favored the varieties with later maturity.

The later planted dates had significantly lower yields this season. The higher seeding rates of 120 pounds of seed per acre had a higher yield for the Nekota variety. The fall of 1997 was much longer and the rates of seeding may not be as important because of the more abundant fall growth of the winter wheat.

Figure 1: Yields of four selected varieties over the four planting dates in 1997.



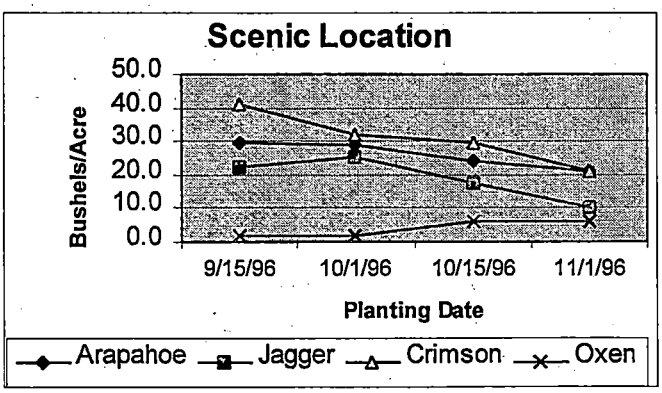


Table 25. September 15th Planting Date.

Treatment	New Underwood			Scenic		
	Height inches	Test Wt Lb/Bu	Yield Bu/A	Height inches	Test Wt Lb/Bu	Yield Bu/A
Arapahoe	30.3	49.6	49.9	32.0	52.9	29.8
Jagger	25.3	49.3	32.1	29.3	54.6	22.4
2137	27.5	51.6	58.8	29.3	53.3	25.8
Nekota 60#	26.3	51.7	53.5	28.5	53.8	32.7
Ogallala	25.0	50.9	46.0	24.5	55.7	21.6
SD 89153	30.8	51.8	52.4	35.5	55.5	40.8
Elkhorn	39.0	51.0	53.0	41.3	51.6	34.5
Nekota 75#	26.5	50.3	53.3	29.0	53.5	31.9
Nekota 90#	28.5	50.1	54.0	28.8	53.8	32.7
Nekota 120#	27.5	51.5	59.8	28.0	54.0	32.4
Oxen (spring wheat)	27.8	44.0	9.3	26.8	--	1.9
LSD (P=.05)	2.51	1.79	6.03	2.12	0.82	4.78
CV	6.08	2.47	8.78	4.86	1.06	11.88
Average	28.57	50.17	48.56	30.25	53.88	27.85

Table 26. October 1st Planting Date.

Treatment	New Underwood			Scenic		
	Height inches	Test Wt Lb/Bu	Yield Bu/A	Height inches	Test Wt Lb/Bu	Yield Bu/A
Arapahoe	30.3	50.0	46.5	32.5	52.9	28.8
Jagger	26.3	48.9	37.5	27.0	53.7	25.2
2137	26.5	49.9	48.5	28.0	54.3	28.8
Nekota 60#	27.8	50.0	43.7	28.0	54.0	29.5
Ogallala	23.5	48.9	34.2	24.8	55.4	25.9
SD 89153	31.8	49.9	45.0	34.8	55.3	32.2
Elkhorn	36.3	50.5	49.3	40.0	51.3	33.3
Nekota 75#	26.8	51.0	49.7	27.0	53.9	27.0
Nekota 90#	27.0	50.4	51.4	28.3	53.7	30.3
Nekota 120#	28.3	50.5	55.9	27.5	54.1	29.9
Oxen (spring wheat)	27.0	--	3.3	22.3	--	2.1
LSD (P=.05)	1.89	1.69	9.04	1.99	.61	4.09
CV	4.62	2.33	14.81	4.74	.78	10.63
Average	28.3	50.0	42.3	29.1	55.2	27.2

Table 27. October 15th Planting Date.

Treatment	New Underwood			Scenic		
	Height inches	Test Wt Lb/Bu	Yield Bu/A	Height inches	Test Wt Lb/Bu	Yield Bu/A
Arapahoe	31.5	50.0	45.7	27.3	51.8	24.0
Jagger	25.0	50.4	33.5	23.3	53.4	17.3
2137	25.8	50.5	41.4	25.5	52.0	23.7
Nekota 60#	27.3	50.8	37.7	25.8	51.3	24.1
Ogallala	22.8	49.6	28.6	21.8	53.9	17.9
SD 89153	30.3	51.5	43.2	30.0	54.0	29.5
Elkhorn	36.8	51.0	44.7	34.3	51.1	24.1
Nekota 75#	27.8	51.3	40.7	27.0	51.8	37.7
Nekota 90#	28.5	51.1	45.1	25.8	51.9	24.8
Nekota 120#	28.8	51.2	47.9	26.0	52.4	27.4
Oxen (spring wheat)	26.5	47.2	23.6	23.0	50.1	6.0
LSD (P=.05)	2.42	1.31	5.59	2.41	1.95	9.65
CV	5.94	1.80	9.85	6.35	2.58	28.6
Average	28.3	50.4	39.3	26.3	53.4	24.4

Table 28. November 1st Planting Date.

Treatment	New Underwood			Scenic		
	Height inches	Test Wt Lb/Bu	Yield Bu/A	Height inches	Test Wt Lb/Bu	Yield Bu/A
Arapahoe	29.8	47.2	33.6	28.3	52.6	21.1
Jagger	24.8	45.2	22.8	24.5	51.9	10.5
2137	25.3	48.4	27.3	22.0	52.4	9.0
Nekota 60#	27.3	46.9	26.0	25.0	51.0	11.6
Ogallala	23.3	48.3	24.9	21.5	53.4	13.4
SD 89153	31.0	50.6	34.4	28.3	54.3	21.3
Elkhorn	35.0	45.5	31.0	30.5	52.1	19.5
Nekota 75#	27.5	49.2	27.1	26.3	52.4	16.5
Nekota 90#	26.0	48.6	31.8	26.5	52.2	18.3
Nekota 120#	27.3	48.3	32.8	24.5	52.8	17.6
Oxen (spring wheat)	27.0	46.5	23.8	23.3	49.8	5.8
LSD (P=.05)	1.81	2.06	4.84	2.40	1.54	4.18
CV	4.54	2.99	11.7	6.53	2.04	19.3
Average	27.6	47.7	28.7	25.5	54.8	15.3

Select Herbicide for the Control of Weeds in No-Till Safflower

Cooperator: Gregg Krebsbach of New Underwood, SD

Objectives: To evaluate various types of herbicides for control of annual grasses in safflower.
Procedure: The safflower was planted in 20 inch rows into wheat stubble in the 1st 3 ranges with a John Deere 750 no-till drill on May 14,1997. The 4th range was planted in 10 inch rows. The trial was flagged and sprayed on June 25,97. The trial was sprayed at 20 gallons per acre. The trial was flagged on 15 foot centers and sprayed with a ten foot boom, this provided a five foot check strip between treatments to aid in weed control evaluation. The downy brome grass was fully tillered and jointing. The witch grass was 3-4 inches tall. The experiment was applied on a no-till field that had an application of Roundup prior to the planting of the safflower. The air temp was at 71 degrees and soil temp was at 63 degrees. The soil surface was dry and there was a 1-3 mph breeze from the northeast. The safflower was 6-8 inches tall and starting to branch.

Results: are listed in Table 29.

Discussion: The field had been sprayed with Roundup prior to the planting of the safflower. The earlier spraying had missed the downy bromegrass and the witchgrass that emerged after the planting of the safflower. The witchgrass was very heavy in the control plots and in the margins of the treated plots. The control of the witchgrass was very evident at the Sept. 5 rating after harvest. The May spraying of the plots held the witchgrass in control during the full summer. This herbicide is not labeled for use on safflower at this time.

The safflower crop works very well in a no-till crop rotation with wheat or other small grains grown in the drier regions of the state. The safflower works well because it can be planted later than spring wheat and is more drought tolerant than any other broadleaf crop that can be grown in the area. Herbicide labeling for no-till safflowers is currently being evaluated through the IR-4 program for minor use crops, but this process is very slow.

Table 29.

Treatment	Oz prod /Acre	% Control Downy Brome as of July 9,97	% Control Witchgrass as of July 9,97	% Control Witchgrass as of Sept 5,97	Crop Injury (1-5)+	Test Wt. Lbs/Bu	Yield Lbs/A
Select *	6.0	86.3	91.3	93.8	1.0	26.5	1258
Select *	8.0	83.8	92.5	94.8	1.0	25.8	1242
Poast *	16.0	67.5	90.0	91.3	1.0	26.7	1272
Control	None	1.0	1.0	1.0	1.0	28.3	1540
Select * Harmony	6.0 .4	91.3	90.0	92.5	2.4	25.4	1203
Select * Harmony	8.0 .4	87.5	91.3	94.8	2.0	26.3	1142
Poast * Harmony	16.0 .4	70.0	88.8	94.5	2.5	25.0	953
Select *	16.0	93.8	93.8	92.3	1.0	26.8	1364
Select * Glean	8.0 .5	85.0	91.3	93.5	2.0	26.6	1275
Select * Ally	8.0 .10	87.5	91.3	92.5	1.8	26.6	1339
Poast * Ally	16.0 .10	71.3	90.0	91.3	2.0	27.0	1128
	LSD =	8.20	2.99	5.8	.7	1.9	329
	CV =	7.57	2.50	4.70	31.32	4.87	18.29

+= Crop Injury of 1 is least, 5 is most.

* =Crop oil added at 1 quart/acre to spray treatment.

Control of Yellow Foxtail in Sunflowers

Cooperator: Kent Kjerstad of Quinn, SD

Objectives: To evaluate various types of herbicides for control of weeds in sunflowers.

Procedure: The trial was sprayed at 20 gallons per acre with a Suzuki ATV on June 19, 1997. The trial was sprayed with 8004 XR nozzles. The plots were 15 feet wide and the center 10 foot was sprayed. This allowed for a 5 foot unsprayed area next to each side of the plot. The sunflowers were 5 inches tall with 4-6 leaves. The yellow foxtail had 2-5 leaves and was 2-4 inches tall. The field had excellent moisture. The weather conditions were sunny with 1-3 mph wind from the north east.

Results:

Table 30.

Treatment	Oz prod /Acre	% Control Yellow foxtail as of July 3, 97	% Control Purslane as of July 3, 97	% Control Yellow foxtail As of July 21, 97
Select Crop Oil	6.0 32.0	86	68	86
Select Crop Oil	8.0 32.0	91	70	90
Poast Crop Oil	12.0 32.0	81	59	84
Control	--	1.0	1.0	1.0
Assure II	7.0	90	61	89
	LSD =	8	30	3
	CV =	7	37	3

Discussion: The select herbicide was effective in selectively controlling the foxtail in the sunflowers. The poast herbicide was used for comparison to the new select treatment. Early ratings would indicate herbicide treatments had some control of the purslane weed as well. The treatments appear to have promise for use in no-till sunflowers. The poast and select herbicides are grass herbicides and I would expect very little broadleaf weed control from them. For more information on the use of herbicides for weed control in sunflowers refer to fact sheet FS525 OS (Weed Control in Oilseed Crops 1998).

Select Herbicide for the Control of weeds in Fallow

Cooperator: Tim Komes of Sturgis, SD

Objectives: To evaluate various types of herbicides for control of downy bromegrass, kochia, and wild buckwheat in fallow.

Procedure: The trial was sprayed with a Suzuki ATV on May 14,1997. The trial was sprayed with 8002 XR nozzles at 27 psi at 3.5 mph to deliver a 10 gallon per acre spray rate. Winds were calm. Air temp was at 65 degrees and soil temp was at 55 degrees. Downy bromegrass was at the 4 leaf stage and 3 inches tall. Wild buckwheat was 2 inches tall and kochia was in late rosette stage. Control ratings for downy brome grass, kochia, and wild buckwheat were taken on May 29,1997.

Results: Table 31.

Treatment	Oz prod /Acre	% Control Downy Brome as of May 29, 97	% Control Kochia as of May 29, 97	% Control Wild Buckwheat as of May 29, 97
Select *	6.0	60.0	60.0	75.0
2,4-D	16.0			
28-0-0	32.0			
Select *	8.0	55.0	50.0	62.5
2,4-D	16.0			
28-0-0	32.0			
Select *	10.0	57.5	53.8	63.8
2-4-D	16.0			
28-0-0	32.0			
Select*	6.0	52.5	70.0	72.5
Banvel	8.0			
28-0-0	32.0			
Select *	8.0	62.5	73.8	95.0
Banvel	8.0			
28-0-0	32.0			
Select *	10.0	55.0	71.3	95.0
Banvel	8.0			
28-0-0	32.0			
Roundup Ultra	16.0	99.0	81.0	78.8
Am Sulfate	17.0			
Landmaster	54.0	99.0	88.5	97.0
Control		1.0	1.0	1.0
LSD =		7.1	16.3	27.2
CV =		8.1	18.3	26.1

* =Crop oil added at 1 quart/acre to spray treatment.

Discussion: The select was very slow in its action on the downy bromegrass and the plants were yellowed and stunted but did not dry up like the plants treated with Roundup Ultra or Landmaster herbicides. The plants did not grow after the application of the select but I am sure a grower would not have been satisfied with the level of control seen in the field. If you had a crop growing in the field like sunflower you would most likely feel that the select did an excellent job of selective weed control.

Downy Bromegrass Control in Winter Wheat with MON37532

Cooperator: Kent Kjerstad of Quinn, SD

Objectives: To evaluate varying rates of MON37532 for Downy bromegrass control in various growth stages of winter wheat.

Procedure: The MON37532 herbicide was applied on 3 spray dates with a 4 wheel ATV sprayer using 8002 nozzles at a rate of 10 gallons/acre. The plots were 15 feet wide. We sprayed with a ten foot spray-boom width. This gave us a five foot check on each side to aid in control ratings.

The early post-emerge(E-POS) was applied on October 28,96. The ground was wet and wind was calm. It rained again approximately .50" that evening after the treatments were applied. The winter wheat was in the 3-4 leaf stage of growth and the downy bromegrass was in the 3 leaf or smaller stage. The downy bromegrass was very heavy in the north end of the plots along the field road. Soil temp was at 42 degrees F. Air temp was at 60 degrees F.

The early spring application (E-SP) was made on April 3, 97. The downy bromegrass had greened up and was growing with 2-6 tillers. The wind was from the southwest at 5-7 mph. Air temp was at 48 degrees and the soil temp was at 41 degrees.

The late spring application (L-SP) was made on May 5,97. Downy bromegrass was fully tillered with 4-5 leaves and the winter wheat was at 4 tillers with 7-8 leaves.

Results: Table 32.

Treatment	Oz prod/Acre	Timing of Application	Date of Spraying	Downy brome % Control	Crop Injury (1-5)✚	Test Wt. Lb/Bu	Yield Bu/A
MON37532*	.34	E-POS	Oct28,96	88.8	1.3	53.7	38.1
MON37532*	.49	E-POS	Oct28,96	91.3	1.0	54.3	39.7
MON37532*	.66	E-POS	Oct28,96	91.3	1.3	55.4	35.9
Control	N/A	N/A	N/A	1.0	1.0	51.5	25.6
MON37532*	.34	E-SP	Apr3,97	81.3	1.0	55.6	38.5
MON37532*	.49	E-SP	Apr3,97	87.5	1.0	53.9	39.1
MON37532*	.66	E-SP	Apr3,97	85.0	1.3	55.5	40.6
MON37532*	.34	L-SP	May5,97	36.3	1.0	55.2	34.5
MON37532*	.49	L-SP	May5,97	45.0	1.0	56.1	37.0
MON37532*	.66	L-SP	May5,97	37.5	1.3	55.9	35.5
LSD(0.05) =				15.6	.4	2.2	4.2
CV =				16.5	23.5	2.7	7.9

*=Surfactant(R-11)used at .5% or 6.4 oz/acre on a 10 gallon per acre rate.
✚= Crop Injury of 1 is least, 5 is most.

Discussion: Use of MON 37532 at E.Pos or at E-SP was very effective at downy bromegrass control. Yields and test weights were significantly increased on these treatments over the control. Spraying in the late-spring (L-SP) provided suppression but not control of the downy bromegrass. We have had three years of work with this new herbicide prior to labeling of the product. At this time, the herbicide has not been labeled in the United States and can not be used on winter wheat to control downy bromegrass. The herbicide appears to work best when it is applied in the fall after the wheat has emerged and the downy bromegrass is just emerged. This time of application will allow for the movement of the herbicide into the soil by fall moisture. The herbicide works mostly from soil absorption by the plant roots and so it needs to be in the rooting zone of the downy bromegrass as it starts its growth in the spring. Late spring applications will be more variable in weed control because the plants are larger and there may not be rains to move the herbicide into the rooting zone.

Grasshopper Control in Winter Wheat

Cooperator: David Finneman of New Underwood, SD

Objectives: To evaluate seed treatments to control grasshoppers in the fall.

Procedure: The seed was treated with the Orthene & Gaucho treatments prior to planting. The furadan was a treatment applied with 6 gal/acre of 10-34-0 starter fertilizer.The winter wheat was planted on August 29,1996. To prevent contamination, the control was planted first. Next the low level of Orthene then medium then high rate was planted. The gaucho treated seed was planted next and the Furadan 4L treated seed was planted last. The experiment was planted east to west with a JD 610 double notched opener drill. Each plot was 40 foot wide and 60 foot long. There were 3 ranges in the trial going from north to south. The trial was planted next to a CRP location where grasshopper populations were high. Our CRP study adjoining this trial area was planted to safflower.

Grasshoppers were heavily populated in the safflower (warmer open ground) and fed in from the side onto the growing winter wheat. Results are listed in Table 33.

Results: Table 33.

Treatment	Oz prod /Acre	Type of Application	Grasshopper feeding in feet As of Oct.15,97	Crop Regrowth after grasshopper feeding As of Oct.15,97 (1-5)✚	Test Wt. Lb/Bu	Yield Bu/A
Orthene	4	Seed Applied	10.3	1.7	59.2	28.4
Orthene	8	Seed Applied	8.3	2.0	58.4	28.1
Orthene	16	Seed Applied	7.0	1.3	58.3	30.2
Control	N/A	N/A	11.7	2.3	59.4	25.9
Gaucho	3	Seed Applied	4.7	3.7	59.4	34.2
Furadan	8	Fertilizer Applied	7.0	3.0	58.6	33.5
	LSD =		3.2	1.4	1.6	4.5
	CV =		21.3	34.1	1.5	8.2

✚= Crop Regrowth of 1 is having no regrowth, 5 is having 3 leaves regrowth.

Discussion: The fall seed treatments were effective in controlling the grasshoppers when compared to the control plots. However, the grasshoppers did eat some of the wheat from the edge of the fields before they are killed. The distance the grasshoppers ate into the field was reduced with the better treatments and this was reflected in the crop yield. The distance the hoppers ate into the fields was limited, indicating that they returned to the edge of the field each night. The yields were taken from the edge of the plot including areas where the wheat had been killed by repeated fall feeding.